LASER PRINTER
SERVICE MANUAL

MODEL:HL-820/1020/1040/1050

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PREFACE

This service manual contains basic information required for after-sales service of the laser printer (here- in-after referred to as "this machine" or "the printer"). This information is vital to the service technician to maintain the high printing quality and performance of the printers.

This service manual covers the HL-820, 1020, 1040 and 1050 laser printers. (Note that any figures for the printer body are based on the HL-1040 printer.)

This manual consists of the following chapters:

CHAPTER I : FEATURES AND SPECIFICATIONS

Features, specifications, etc.

CHAPTER II : THEORY OF OPERATION

Basic operation of the mechanical system, the electrical system and the electrical circuits, and their timing information.

CHAPTER III : DISASSEMBLY AND REASSEMBLY

Procedures for disassembling and reassembling the mechanical system.

CHAPTER IV : MAINTENANCE AND TROUBLESHOOTING

Reference values and adjustments, troubleshooting image defects, troubleshooting malfunctions, etc.

APPENDICES : SERIAL NO. DESCRIPTIONS, CONNECTION DIAGRAMS, PCB CIRCUIT DIAGRAMS.

Information in this manual is subject to change due to improvement or re-design of the product. All relevant information in such cases will be supplied in service information bulletins (Technical Information).

A thorough understanding of this printer, based on information in this service manual and service information bulletins, is required for maintaining its print quality performance and for improving the practical ability to find the cause of problems.

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CHAPTER I FEATURES AND SPECIFICATIONS

1. FEATURES

This printer has the following features:

High Resolution and Fast Printing Speed

<HL-820>
True 600 dots per inch (dpi) with microfine toner and 8 pages per minute (ppm) printing speed (A4 or Letter paper).

<HL-1040/1020>
True 600 dots per inch (dpi) with microfine toner and 10 pages per minute (ppm) printing speed (A4 or Letter paper).

<HL-1050>
True 600 dots per inch (dpi) and 1200 x 600 dpi for graphics with microfine toner and 10 pages per minute (ppm) printing speed (A4 or Letter paper).

Enhanced Printing Performance and User-Friendly Operation for Windows

The dedicated printer driver and TrueType™-compatible fonts for Microsoft® Windows 3.1 and Windows 95 are available on the floppy disk and CD-ROM supplied with your printer. You can easily install them into your Windows system using our installer program. The driver supports our unique compression mode to enhance printing speed in Windows applications and allows you to set various printer settings including toner saving mode, custom paper size, sleep mode, gray scale adjustment, resolution, and so forth. You can easily setup these print options in the graphic dialog boxes through the Printer Setup menu within the Windows Control Panel.

Printer Status Monitor with Bi-directional Parallel Interface

The printer driver can monitor your printer's status using bi-directional parallel communications.

The printer status monitor program can show the current status of your printer. When printing, an animated dialog box appears on your computer screen to show the current printing process. If an error occurs, a dialog box will appear to let you know what to correct. For example: when your printer is out of paper, the dialog box will display "No Paper" and instructions for the corrective action to take.

Versatile Paper Handling

The printer has a multi-purpose sheet feeder and a straight paper path mechanism. Using this mechanism, you can load A4, letter, legal, B5, A5, A6, and executive sizes of paper, and various types of media including envelopes, organizer paper, or your custom paper size. The multi-purpose sheet feeder also allows manual paper loading, so you can also use labels and transparencies.

Environment-Friendly

♦ Economy Printing Mode

This feature will cut your printing cost by saving toner. It is useful to obtain draft copies for proof-reading. You can select from two economy modes, 25% toner saving and 50% toner saving, through the Windows printer driver supplied with your printer.

♦ Sleep Mode (Power Save Mode)

Sleep mode automatically reduces power consumption when the printer is not in use. The printer consumes less than 13W when in sleep mode.

♦ Low Running Cost

The toner cartridge is separate from the drum unit. You need to replace only the toner cartridge after around 2,400 pages, which is cost effective and ecologically friendly.

The actual number of pages printed with each toner cartridge may vary depending on your average type of print job.

Enhanced Memory Management

The printer provides its own data compression technology in its printer hardware and the supplied printer driver software, which can automatically compress graphic data and font data efficiently into the printer's memory. You can avoid memory errors and print most full page 600dpi graphic and text data, including large fonts, with the standard printer memory.

Remote Printer Console Program for DOS (for HL-1040/1050 only)

The utility program, Remote Printer Console (RPC), is available on the floppy disk and CD-ROM supplied with your printer. When you operate your computer in the DOS (Disk Operating System) environment, this program allows you to easily change the default settings of the printer such as fonts, page setup, emulations and so on.

This program also provides a status monitor program, which is a Terminate-and-Stay Resident (TSR) program. It can monitor the printer status while running in the background and report the current status or errors on your computer screen.

Popular Printer Emulation Support (for HL-1040/1050 only)

These printers support the following printer emulation modes;
The HL-1040 supports HP LaserJet IIP, Epson FX-850, and IBM Proprinter XL
The HL-1050 supports HP LaserJet 6P/6L, Epson FX-850 and IBM Proprinter XL.

When you use DOS application software or Windows™ version 3.0 or earlier, you can use any of these emulations to operate the printer in the 300 dpi resolution mode. The printers also support Auto-emulation switching between HP and Epson or HP and IBM. If you want to set the printer emulation, you can do it using the Remote Printer Console Program.

USB Interface (for HL-1050 only)

The Universal Serial Bus Interface is an interface which allows the printer to connect to multiple peripheral devices.

High Resolution Control & Advanced Photoscale Technology (for HL-1050 only)

High resolution control (HRC) technology provides clear and crisp printouts. Use this function to get smooth text print quality.
Advanced Photoscale Technology enables the printer to print graphics in 256 grayscales, producing nearly photographic quality. Use this function when you want to print photographic images.

Optional Apple Macintosh® Interface (for HL-1040/1050 only)

An optional Apple Macintosh serial interface is available which allows your printer to be connected to Apple Macintosh computers. With this option, you can use your printer with both an IBM PC (or compatible) and an Apple Macintosh at the same time. This optional interface board can be used as an RS-422A interface for Macintosh or an RS-232C serial interface for an IBM PC or compatible.

2. SPECIFICATIONS

2.1 Printing

Print method	Electrophotography by semiconductor laser beam scanning	
Laser:	Wave length:	780nm
	Output:	5mW max
Resolution	HL-820/1020:	600 x 600dots/inch (for Windows)
	HL-1040:	600 x 600dots/inch (for Windows or DOS) 300 x 300dots/inch (under Apple Macintosh, DOS, or other operating system)
	HL-1050:	1200(H) x 600(V)dots/inch (for Windows DIB graphics) 600 x 600dots/inch (for Windows or DOS) 300 x 300dpi (under Apple Macintosh using optional RS-100M)
Print speed	HL-820:	Up to 8 pages/minute
	HL-1020/1040/1050:	Up to 10 pages/minute (when loading Letter-size paper from the multipurpose sheet feeder)
Warm-up	Max. 30 seconds at 23°C (73.4°F)	
First print	15 seconds (when loading Letter-size paper from the multipurpose sheet feeder)	
Print media	Toner cartridge Life Expectancy: 2,400 pages/cartridge (when printing A4 or letter-size paper at 5% print coverage)	
Developer	Drum unit, separated from toner cartridge	
	Life Expectancy:	20,000 pages/drum unit at 20 pages per job 8,000 pages at 1 page per job

2.2 Functions

CPU	HL-820/1020/1040:	MC68EC000 16Mhz
	HL-1050:	MB86831 66Mhz
Emulation	HL-820/1020:	Brother Printing Solution for Windows
	HL-1040:	Brother Printing Solution for Windows Automatic emulation selection among HP LaserJet IIP (PCL level 4), EPSON FX-850, and IBM Proprinter XL
	HL-1050:	Brother Printing Solution for Windows Automatic emulation selection among HP LaserJet 6P (PCL level 6), EPSON FX-850, and IBM Proprinter XL
Printer driver	Windows™ 3.1/3.11, Windows 95 and Windows NT 4.0 driver, supporting Brother Native Compression mode and bi-directional capability. Optional Macintosh driver available for System 6.0.7 or higher (for HL-1040/1050 only)	

Interface	Bi-directional parallel Universal Serial Bus (USB) (HL-1050 only) RS-422A/RS-232C serial (RS-100M) is optionally available. (HL-1040/1050 only)	
Memory	HL-820/1020/1040:	2.0 Mbytes
	HL-1050:	4.0 Mbytes Expandable up to 36 Mbytes by installing an industry standard SIMM
Control panel	1 switch and 4 lamps	
Diagnostics	Self-diagnostic program	

2.3 Electrical and Mechanical

Power source	U.S.A. and Canada:	AC 110 to 120V, 50Hz/60Hz
	Europe and Australia:	AC 220 to 240V, 50Hz/60Hz
Power consumption	Printing (peak):	820W or less
	Printing (average):	280W or less
	Standing by:	60W or less
	Sleep:	13W or less
Noise	Printing:	49dB A or less
	Standing by:	33dB A or less
Temperature	Operating:	10 to 32.5°C (50 to 90.5°F)
	Storage:	0 to 40°C (38 to 104°F)
Humidity	Operating:	20 to 80% (non condensing)
	Storage:	10 to 85% (non condensing)
Dimensions (W x D x H)	390 x 365 x 245 mm (15.4 x 14.4 x 9.7 inches) (when the output tray is closed.)	
Weight	Approx. 7.2kg (15.7lb.) including the drum unit and toner cartridge	

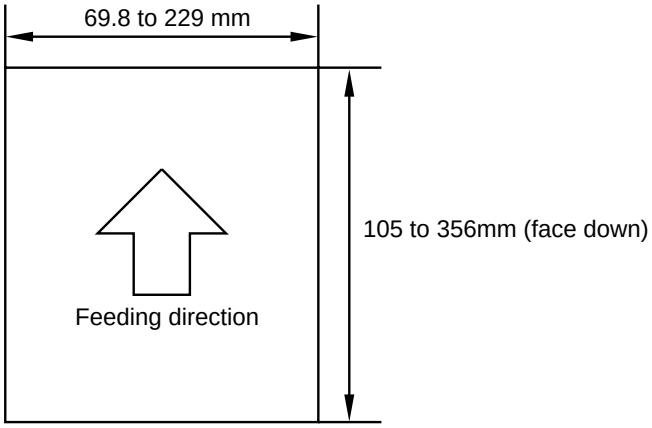
Note:

- *The peak figure of power consumption is worked out when the halogen heater lamp is turned ON.*
- *The peak figure of power consumption is worked out excluding inrush current value.*
- *Be sure that the peak figure of power consumption is reference value and should be used inside the Brother offices only.*

2.4 Paper Loading

(1) Multi-purpose sheet feeder loading

Paper size: A4, Letter, Legal, B5, A5, A6, and Executive. Other sizes of media that can be handled by the feed mechanism can be loaded.



Feedable paper weight:	60 (16lb.) to 158 (42lb.) g/m^2
Maximum load height :	22mm (200 sheets of 80g/m^2 paper) letter or A4 size
Setting method:	Pull the MP sheet feeder cover toward you, insert the stack of paper into the feeder, aligning the top edge of the sheets, then push the cover back to its original position.

(2) Manual slot loading

Paper size:	Same as in (1) for the multi-purpose sheet feeder.
Feedable paper weight:	Same as in (1) for the multi-purpose sheet feeder.
Setting methods:	Place the side of the paper to be printed on face down into the manual feed slot after selecting orientation. Align the paper at the center of the manual feed slot, and be sure to insert it fully into the feed slot. Move the paper guide of the manual feed slot to the paper width.

Cautions:

- *Before loading paper with holes such as organizer sheets, be sure to fan the stack well.*
- *When printing on the back of pre-printed paper, be sure to straighten the paper as much as possible.*

2.5 Print Delivery

(1) With the output tray opened
Tray capacity: Maximum 100 sheets (80g/m^2), face-down only

(2) With the output tray closed
Tray capacity: 1 sheet (80g/m^2), face-down only

Note:

- *Face down: Deliver the printed face of the paper downward.*
- *Environment : 23°C*

2.6 Paper

(1) Paper type

(a) Normal paper (60 to 157g/m^2, specified types of high-quality paper)

- A4 size
- Letter size
- Legal size
- B5 (JIS ISO) size
- A5 size
- A6 size
- Executive size

* The recommended types of plain paper are as follows:
Letter : Xerox 4200 (75g/m^2)
A4 : Xerox 80 Premier Paper (80g/m^2)

(b) Special paper (specified types)

- Labels
- Envelopes (DL, C4, C5, COM10, Monarch)
- Organizers (K, L, and J sizes of DAY-TIMERS)

(C) Other detailed specifications

	Cut Sheet	Envelope
Basis Weight	60 to 158 g/m^2 (16 to 42 lb.)	75 to 90 g/m^2 (20 to 24 lb.) single thickness
Caliper	±0.03 to ±0.08 in. (0.08 to 0.2 mm)	0.0033 to 0.0058 in. (0.084 to 0.14 mm) single thickness
Moisture Content	4% to 6% by weight	4% to 6% by weight
Smoothness	100 to 250 (Sheffield)	100 to 250 (Sheffield)

Caution:

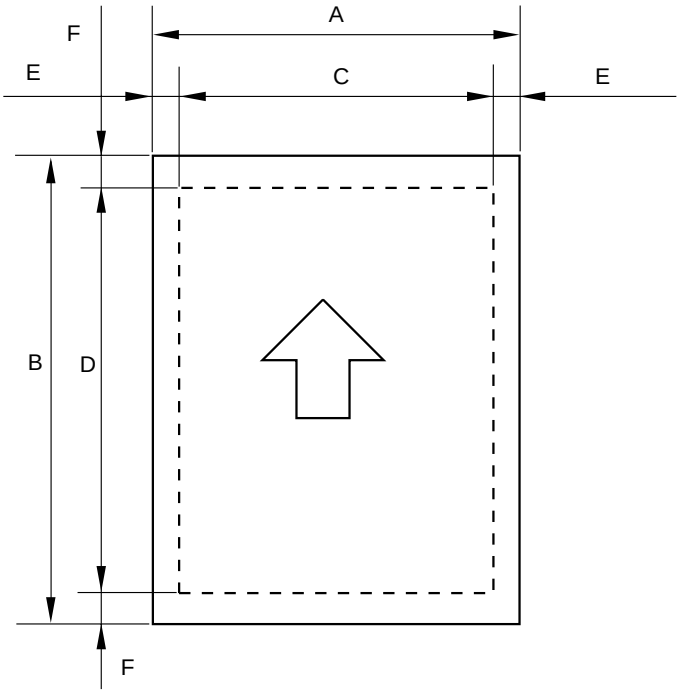
- *Although the printer can handle 9 inches (229mm) width paper such as the C4 size envelope, you may get stains on the paper outside 8.5 inches width or on the back of the paper.*
- *It is recommended to use long-grained paper for the best print quality. If short-grained paper is being used, it might be the cause of paper jams.*
- *Use neutral paper. Do not use acid paper to avoid any damage to the printer drum unit.*

(2) Paper feed conditions

Type	Name	Feeder	Manual feed
Normal paper (cut sheet)	60 to 80 g/m^2	○ (200 sheets)	○
	80 g/m^2 paper (Legal)	○ (100 sheets)	○
	158 g/m^2	○ (30 sheets)	○
Special paper (cut sheet)	Labels	○ (50 sheets)	○
	Envelopes	○ (10 sheets)	○
	Organizers	○ (10 sheets)	○

2.7 Effective Printing Area

Printable area



The effective printing area means the area within which the printing of all the data received without any omissions can be guaranteed.

The table below shows the effective printing areas.

Size	A	B	C	D	E	F
A 4	210.0mm 8.27” (2,480 dots)	297.0mm 11.69” (3,507 dots)	203.2mm 8.0” (2,400 dots)	288.5mm 11.36” (3,407 dots)	3.4mm 0.13” (40 dots)	4.23mm 0.17” (50 dots)
Letter	215.9mm 8.5” (2,550 dots)	279.4mm 11.0” (3,300 dots)	203.2mm 8.0” (2,400 dots)	270.9mm 10.67” (3,200 dots)	6.35mm 0.25” (75 dots)	↑
Legal	215.9mm 8.5” (2,550 dots)	355.6mm 14.0” (4,200 dots)	203.2mm 8.0” (2,400 dots)	347.1mm 13.67” (4,100 dots)	↑	↑
B 5 (JIS)	182.0mm 7.16” (2,149 dots)	257.0mm 10.12” (3,035 dots)	173.5mm 6.83” (2,007 dots)	248.5mm 9.78” (2,935 dots)	6.01mm 0.24” (71 dots)	↑
B 5 (ISO)	176.0mm 6.93” (2,078 dots)	250.0mm 9.84” (2,952 dots)	164.0mm 6.46” (1,936 dots)	241.5mm 9.5” (2,852 dots)	↑	↑
Executive	184.15mm 7.25” (2,175 dots)	266.7mm 10.5” (3,150 dots)	175.7mm 6.92” (2,025 dots)	258.2mm 10.17” (3,050 dots)	6.35mm 0.25” (75 dots)	↑
A 5	148.5mm 5.85” (1,754 dots)	210.0mm 8.27” (2,480 dots)	136.5mm 5.37” (1,612 dots)	201.5mm 7.93” (2,380 dots)	6.01mm 0.24” (71 dots)	↑
A6	105.0mm 4.13” (1,240 dots)	148.5mm 5.85” (1,754 dots)	93.0mm 3.66” (1,098 dots)	140.0mm 5.51” (1,654 dots)	↑	↑
Organizer (J size)	69.85mm 2.75” (825 dots)	127.0mm 5.0” (1,500 dots)	56.2mm 2.21” (675 dots)	118.5mm 4.66” (1,400 dots)	6.35mm 0.25” (75 dots)	↑
Organizer (K size)	95.25mm 3.75” (1,125 dots)	171.45mm 6.75” (2,025 dots)	86.78mm 3.42” (975 dots)	162.98mm 6.42” (1,925 dots)	↑	↑
Organizer (L size)	139.7mm 5.5” (1,650 dots)	215.9mm 8.5” (2,550 dots)	131.23mm 5.17” (1,500 dots)	207.43mm 8.17” (2,450 dots)	↑	↑
COM-10	104.78mm 4.125” (1,237 dots)	241.3mm 9.5” (2,850 dots)	92.11mm 3.63” (1,087 dots)	232.8mm 9.16” (2,750 dots)	↑	↑
MONARCH	98.43mm 3.875” (1,162 dots)	190.5mm 7.5” (2,250 dots)	85.7mm 3.37” (1,012 dots)	182.0mm 7.16” (2,150 dots)	↑	↑
C 4	228.6mm 9.0” (2,700 dots)	304.8mm 12.0” (3,600 dots)	203.2mm 8.0” (2,400 dots)	296.3mm 11.66” (3,500 dots)	12.7mm 0.5” (150 dots)	↑
C 5	162mm 6.38” (1,913 dots)	229mm 9.01” (2,704 dots)	150.0mm 5.9” (1,771 dots)	220.5mm 8.68” (2,604 dots)	6.01mm 0.24” (71 dots)	↑
DL	110mm 4.33” (1,299 dots)	220mm 8.66” (2,598 dots)	98.0mm 3.86” (1,157 dots)	211.5mm 8.33” (2,498 dots)	↑	↑

(Note that the paper sizes indicated here should conform to the nominal dimensions specified by JIS.)

- A4 paper must accommodate 80 characters printed in pica pitch (203.2 mm).
- The dot size is based on 300 dpi resolution.
- Organizer is not supported by any printer emulations (commands).

3. SAFETY INFORMATION

3.1 Laser Safety (110 - 120V Model only)

This printer is certified as a Class 1 laser product under the US Department of Health and Human Services (DHHS) Radiation Performance Standard according to the Radiation Control for Health and Safety Act of 1968. This means that the printer does not produce hazardous laser radiation.

Since radiation emitted inside the printer is completely confined within the protective housings and external covers, the laser beam cannot escape from the machine during any phase of user operation.

3.2 FDA Regulations (110 - 120V Model only)

The US Food and Drug Administration (FDA) has implemented regulations for laser products manufactured on and after August 2, 1976. Compliance is mandatory for products marketed in the United States. One of the following labels on the back of the printer indicates compliance with the FDA regulations and must be attached to laser products marketed in the United States.

The label for Japanese manufactured products

MANUFACTURED: K BROTHER INDUSTRIES, LTD. 15-1, Naeshiro-cho, Mizuho-ku, Nagoya 467-8561, Japan. This product complies with FDA radiation performance standards, 21 CFR Subchapter J.

The label for Chinese manufactured products

MANUFACTURED : C BROTHER Corporation (Asia) Ltd. Shenzen Buji Nan Ling Factory Gold Garden Ind., Nan Ling Village, Buji, Rong Gang, Shenzhen, CHINA This product complies with FDA radiation performance standards, 21 CFR Subchapter J.

3.3 Caution for Laser Product (Warnhinweis für Laserdrucker)

CAUTION: When the machine during servicing is operated with the cover open, the regulations of VBG 93 and the performance instructions for VBG 93 are valid.

CAUTION: In case of any trouble with the laser unit, replace the laser unit itself. To prevent direct exposure to the laser beam, do not try to open the enclosure of the laser unit.

ACHTUNG: Im Falle von Störungen der Lasereinheit muß diese ersetzt werden. Das Gehäuse der Lasereinheit darf nicht geöffnet werden, da sonst Laserstrahlen austreten können.

(1) Location of the laser beam window.

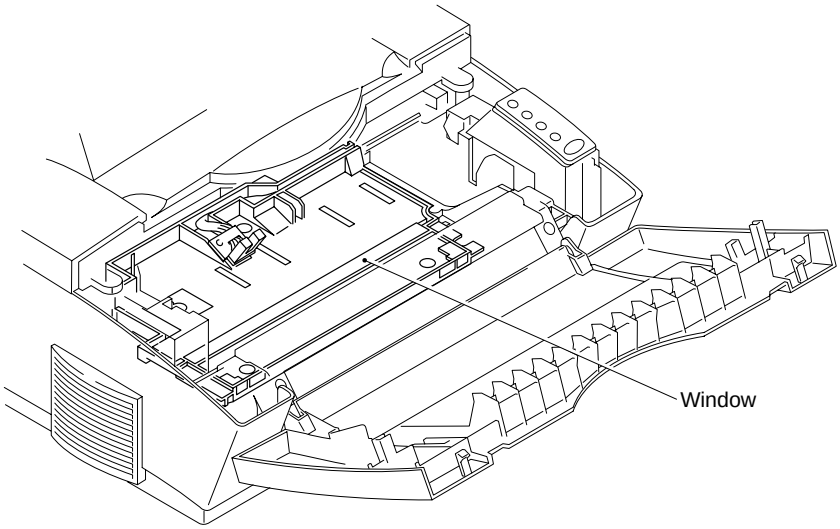


Fig. 1-1

(2) Location of Caution Label for Laser Product. (200V only)

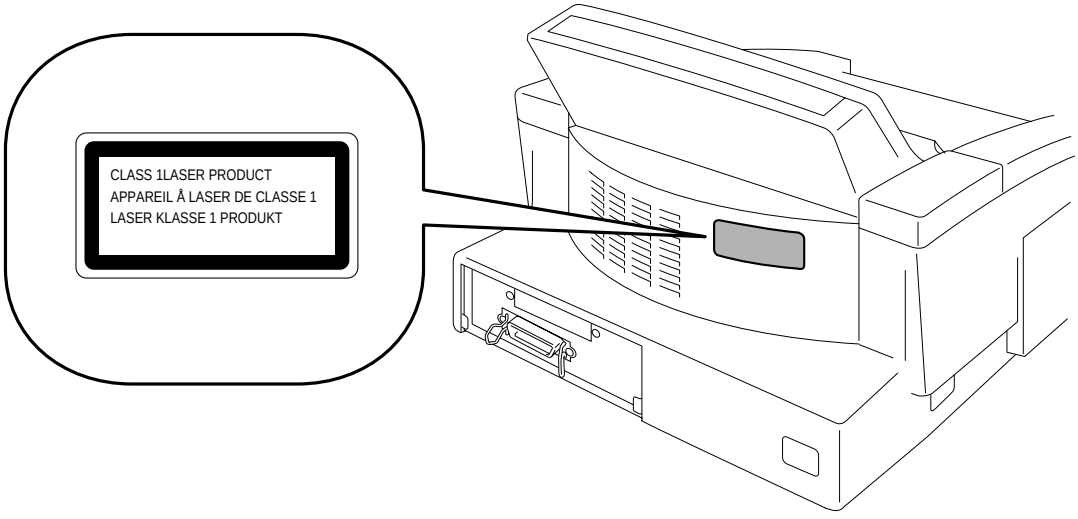


Fig. 1-2

CHAPTER II THEORY OF OPERATION

1. ELECTRONICS

1.1 General Block Diagram

HL-820/1020

Fig. 2-1 shows a general block diagram of the HL-820/1020 printer.

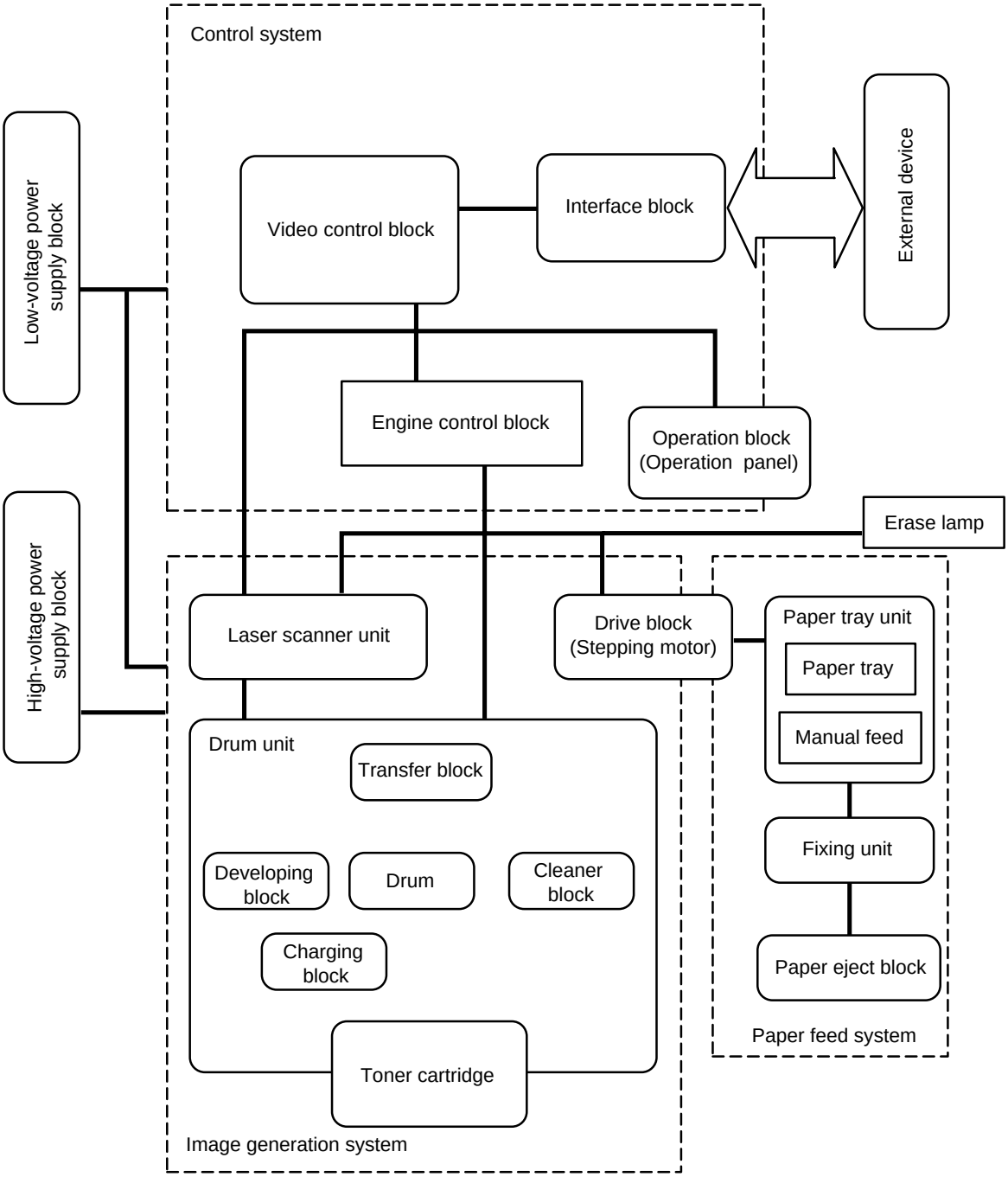


Fig. 2-1

HL-1040

Fig. 2-2 shows a general block diagram of the HL-1040 printer.

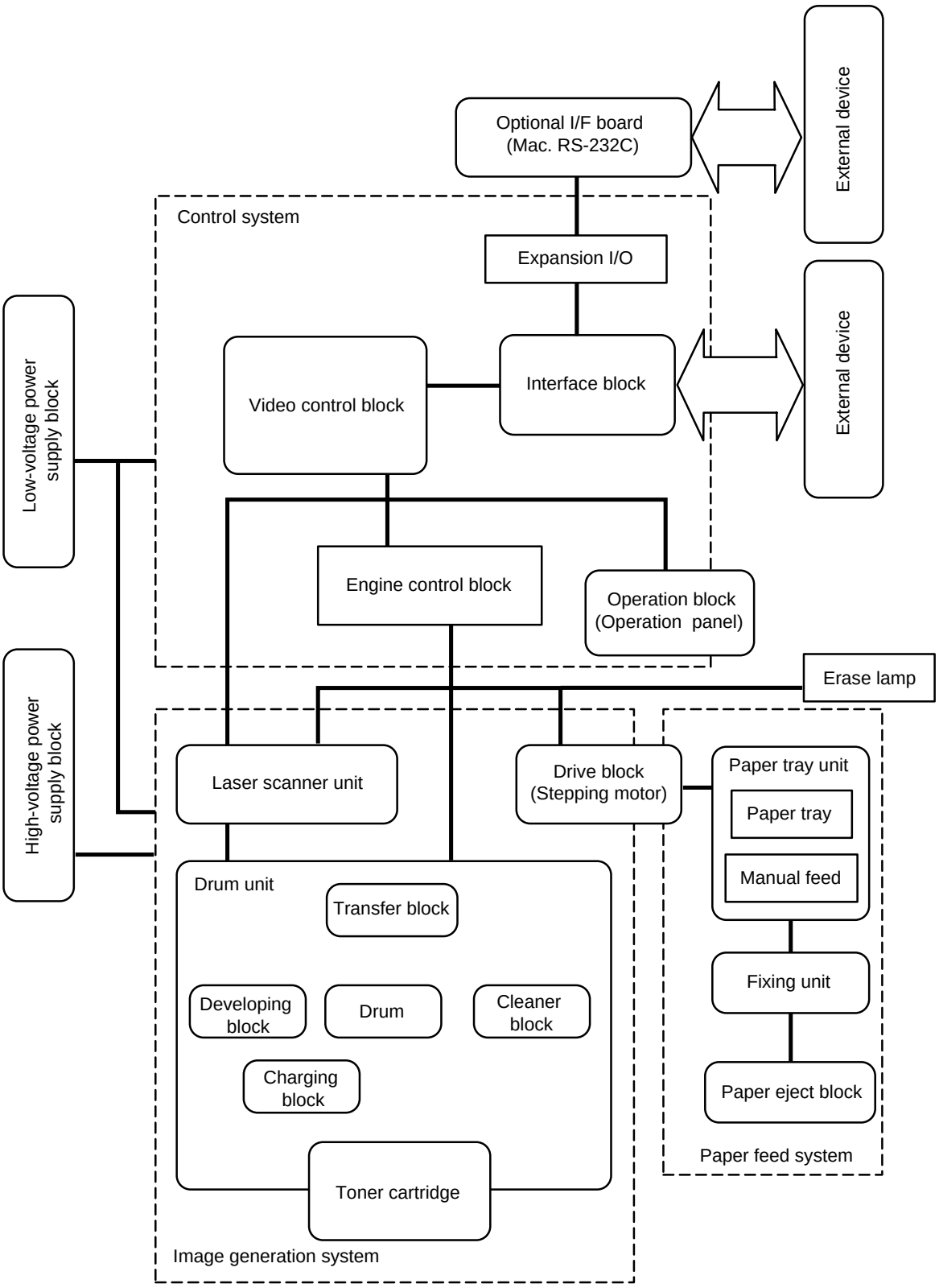


Fig. 2-2

HL-1050

Fig. 2-3 shows a general block diagram of the HL-1050 printer.

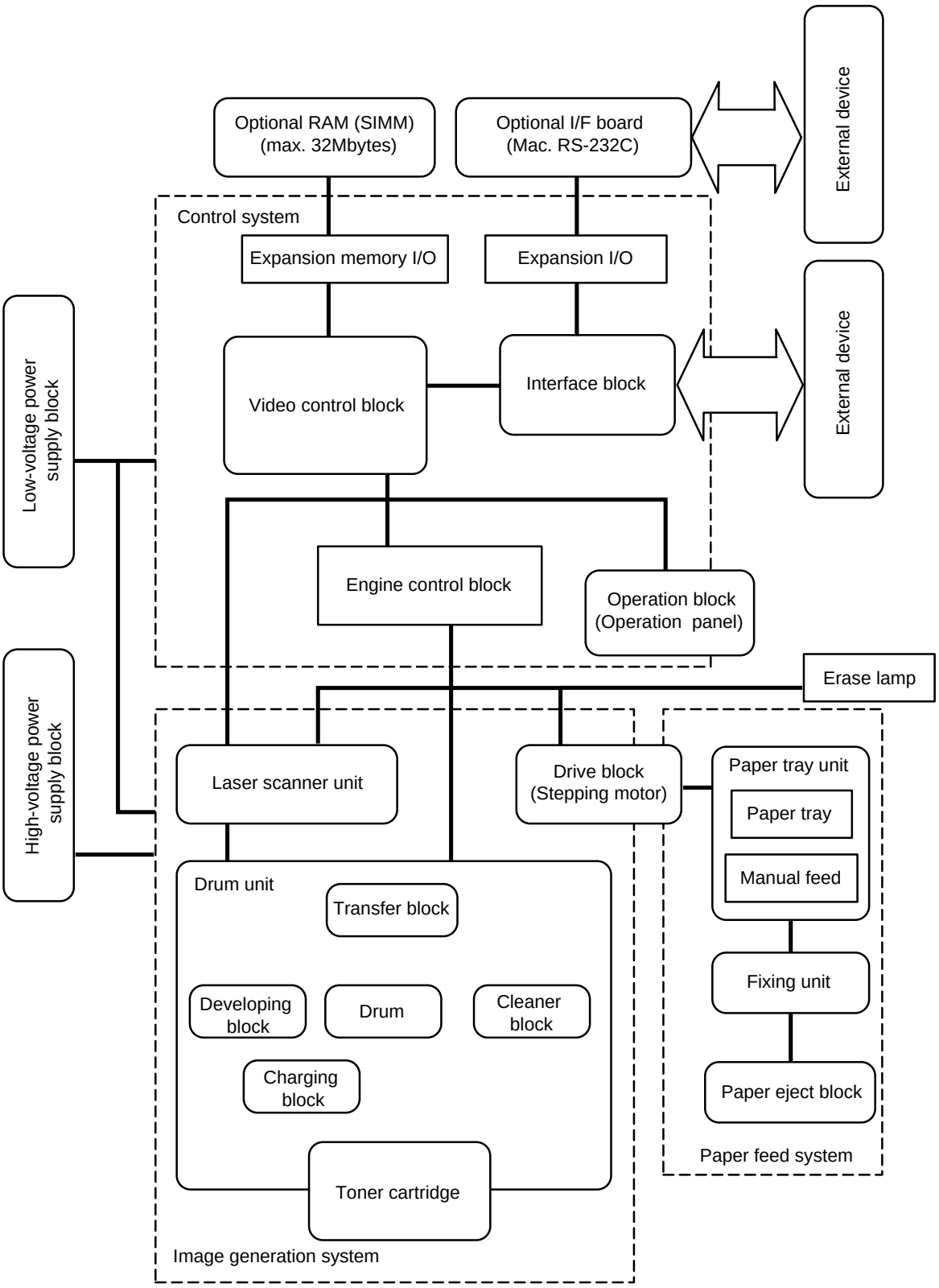


Fig. 2-3

1.2 Main PCB Block Diagram

HL-820/1020

Fig. 2-4 shows the block diagram of the main PCB.

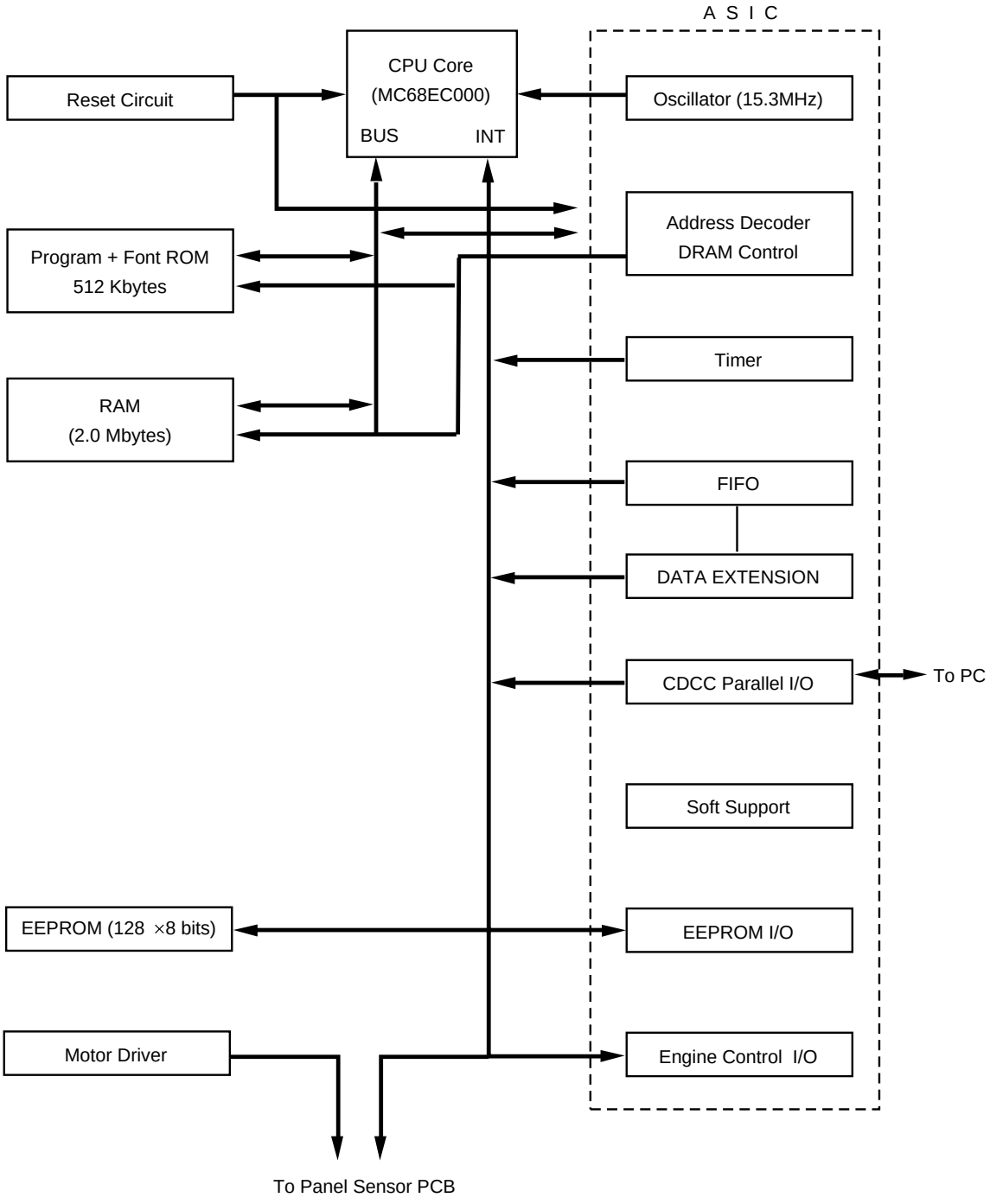


Fig. 2-4

Fig. 2-5 shows the block diagram of the main PCB.

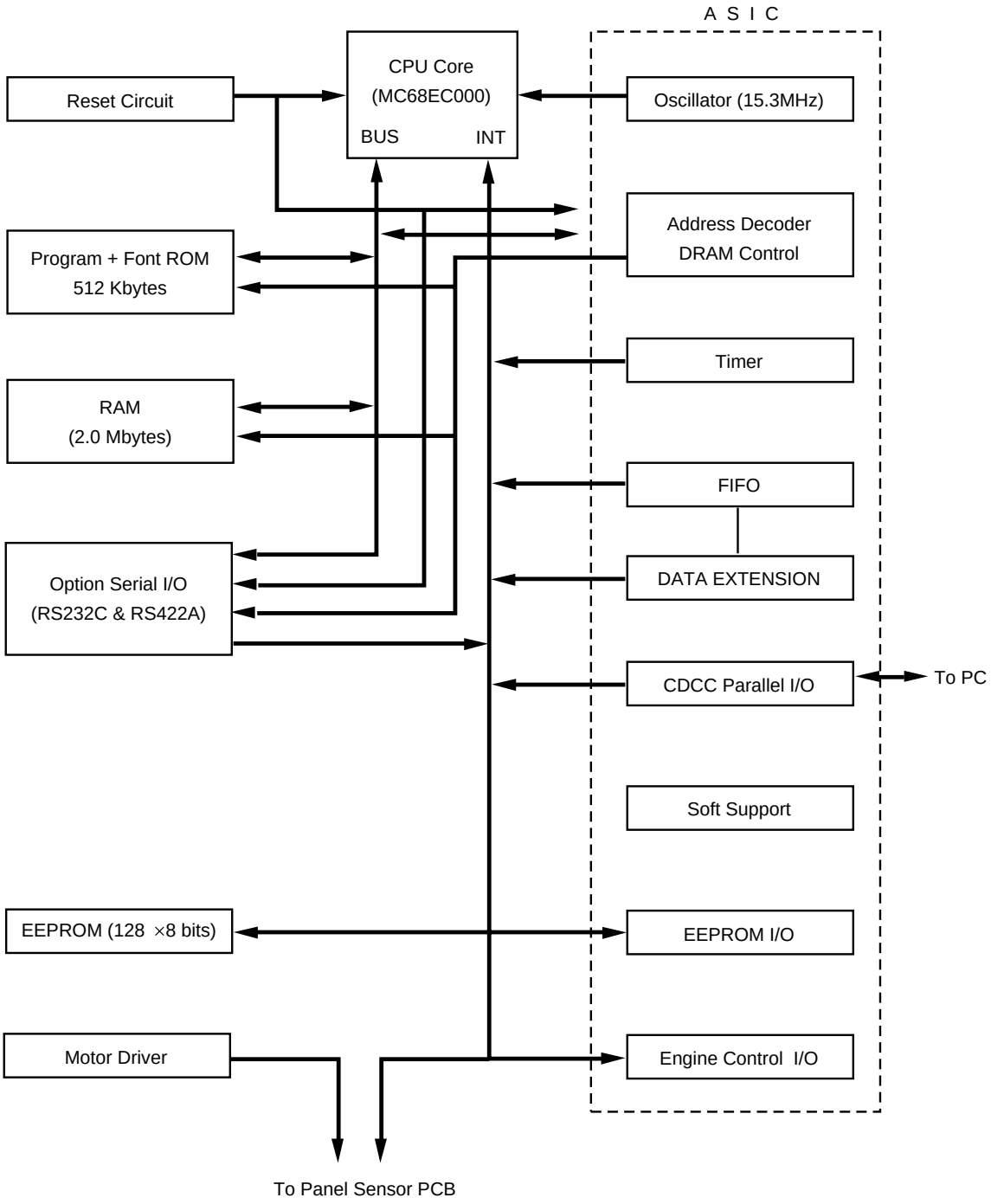


Fig. 2-5

Fig. 2-6 shows the block diagram of the main PCB.

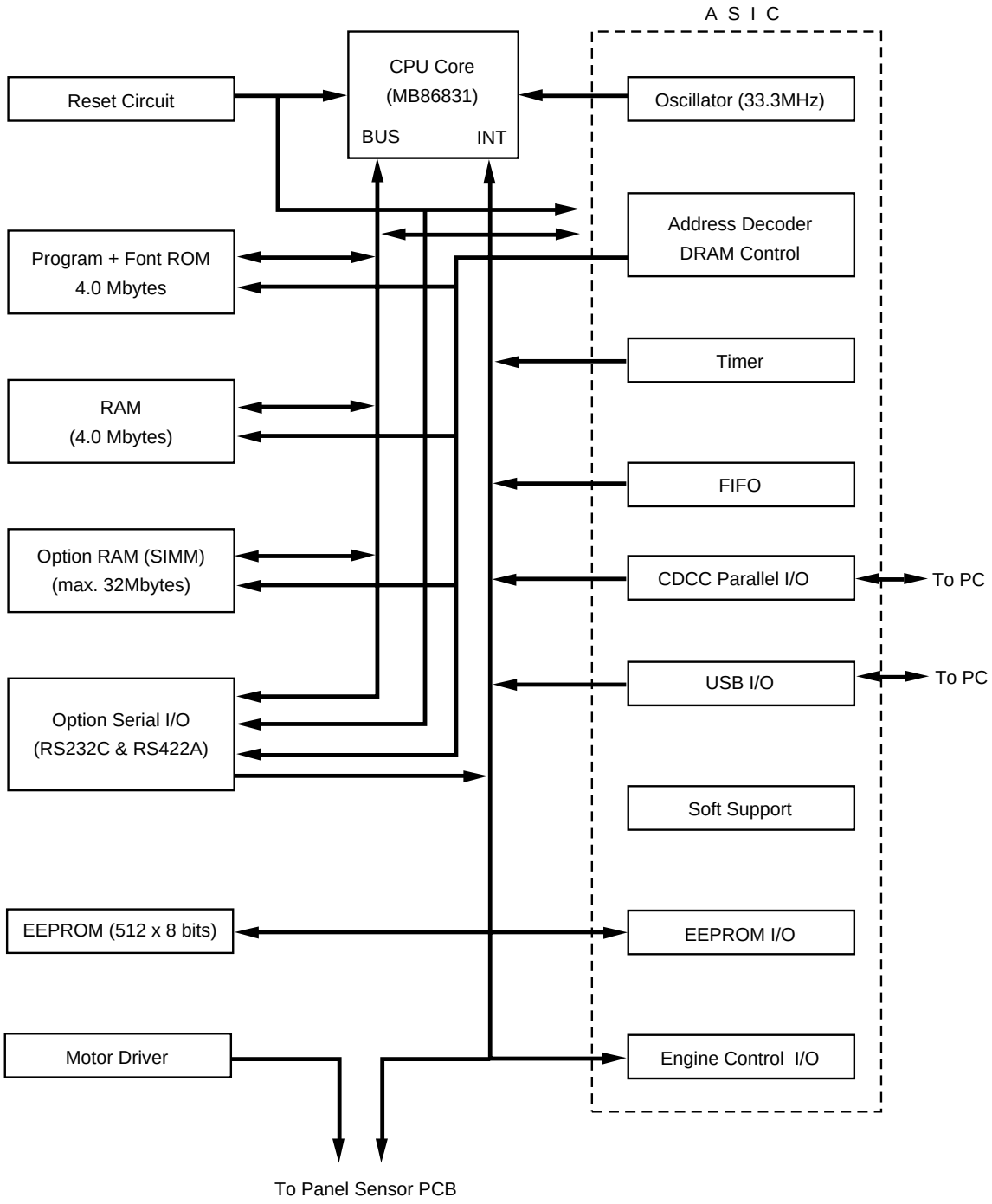


Fig. 2-6

1.3 Main PCB

1.3.1 CPU Core

HL-820/1020/1040

Fig. 2-7 shows the CPU circuit block on the main PCB.

The CPU is a Motorola MC68EC000FN16 which is driven with a clock frequency of 15.3MHz. This clock frequency is made by dividing the source clock of 30.67 MHz into two.

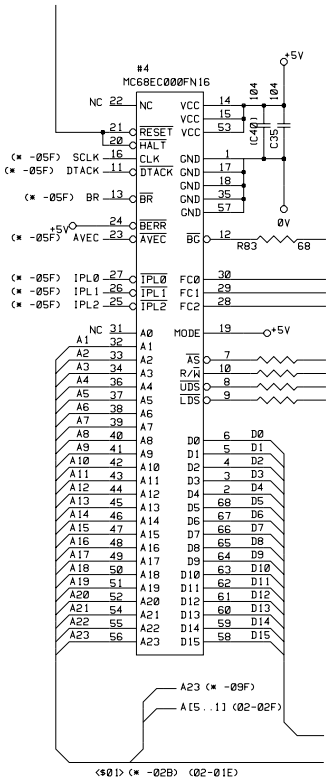


Fig. 2-7

HL-1050

Fig. 2-8 shows the CPU circuit block on the main PCB.

The CPU is a Motorola MB86831 which is driven with a clock frequency of 33MHz. The CPU itself runs at 66MHz.

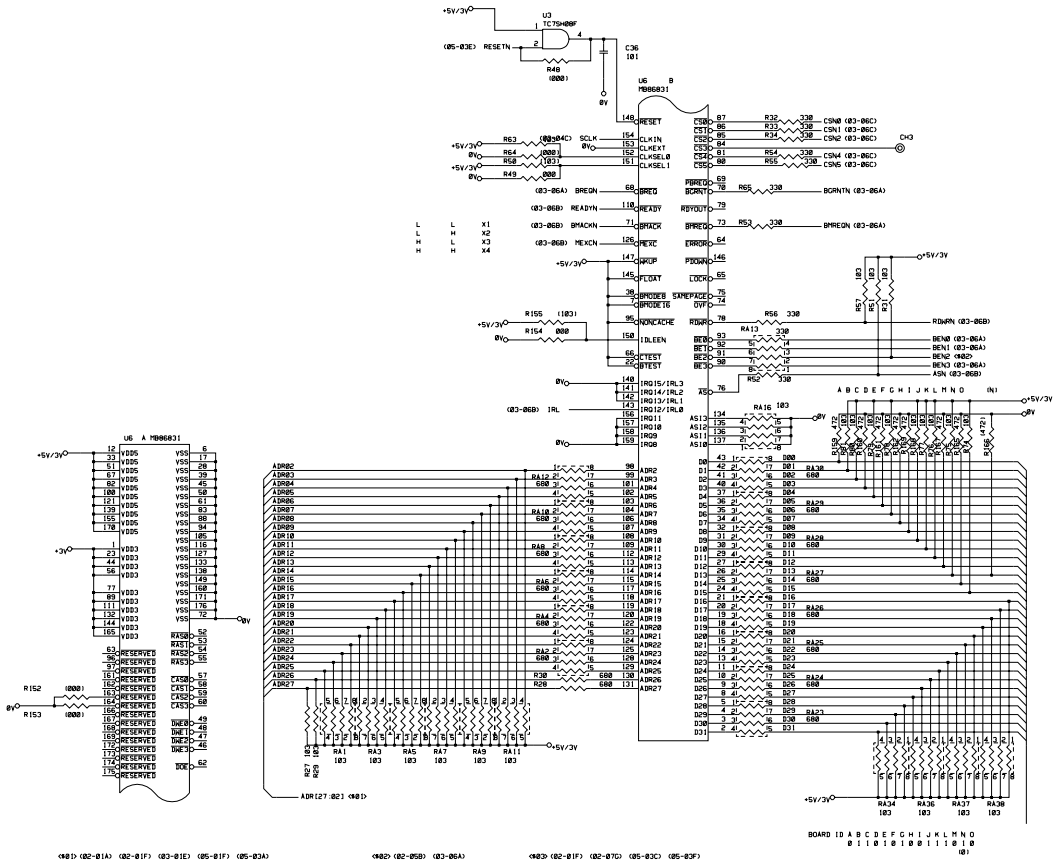


Fig. 2-8

1.3.2 ASIC

HL-820/1020/1040

The ASIC is composed of a Cell Based IC that contains the following functional blocks.

(1) Oscillator circuit

Generates the main clock for the CPU by dividing the source clock frequency into two.

(2) Address decoder

Generates the CS for each device.

(3) DRAM control

Generates the $\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$, $\overline{OE}$ and MA signals for the DRAM and controls refresh processing (CAS before RAS self-refreshing method).

(4) Interrupt control

Interrupt levels:

Priority	High	7	NMI
		6	FIFO
		5	EXINT(Option Serial I/O)
		4	BD / Timer 1
		3	SCANINT
		2	CDCC / BOISE / DATA EXTENSION
	Low	1	Timer 2

(5) Timers

The following timers are incorporated:

Timer 1	16-bit timer
Timer 2	10-bit timer
Timer 3	Watch-dog timer

(6) FIFO

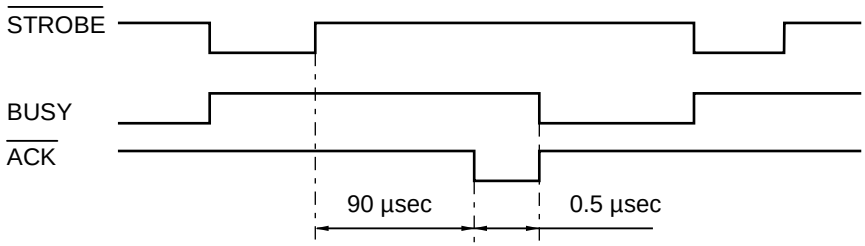
A 5,120-bit FIFO is incorporated. Data for one raster scan is transferred from the RAM to the FIFO by DMA transmission and is output as serial video data. The data cycle is 10.22 MHz.

(7) CDCC parallel I/O

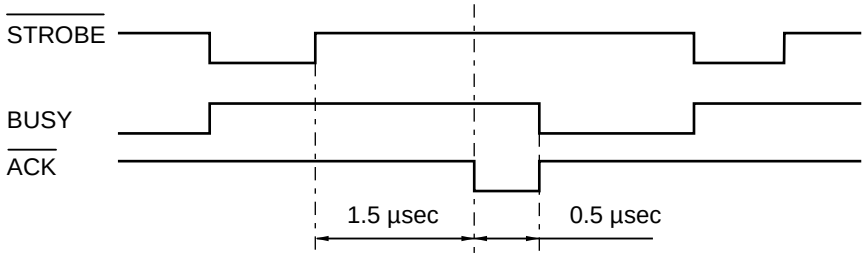
<Data receiving>

There are two modes in this unit. One is the CPU receiving mode and the other is the DMA receiving mode. In the CPU receiving mode the CPU receives the command data from the PC, and after the CPU is switched to the DMA mode, it receives the image data and writes to the DRAM directly.

CPU Receive Mode



DMA Receive Mode



BUSY goes HIGH at the falling edge of STROBE. The data (8 bits) from the PC is latched in the data buffer at the rising edge of STROBE. The pulse width of ACK differs according to the speed MODE as shown above. BUSY goes LOW at the rising edge of ACK.

<IEEE1284 support>

This supports the IEEE1284 data transfer with the following modes.

Nibble mode
Byte mode

(8) Data expansion

This circuit expands the compressed image data received from the PC, and writes the bit map data to the FIFO.

(9) Software support

Supports 16 x 16 rotation, bit expansion, and bit search.

(10) EEPROM I/O

One output port and one I/O port are assigned.

(11) Engine control I/O

This I/O is used for the connection to the panel sensor PCB. It controls the main motor, solenoid, sensors, etc.

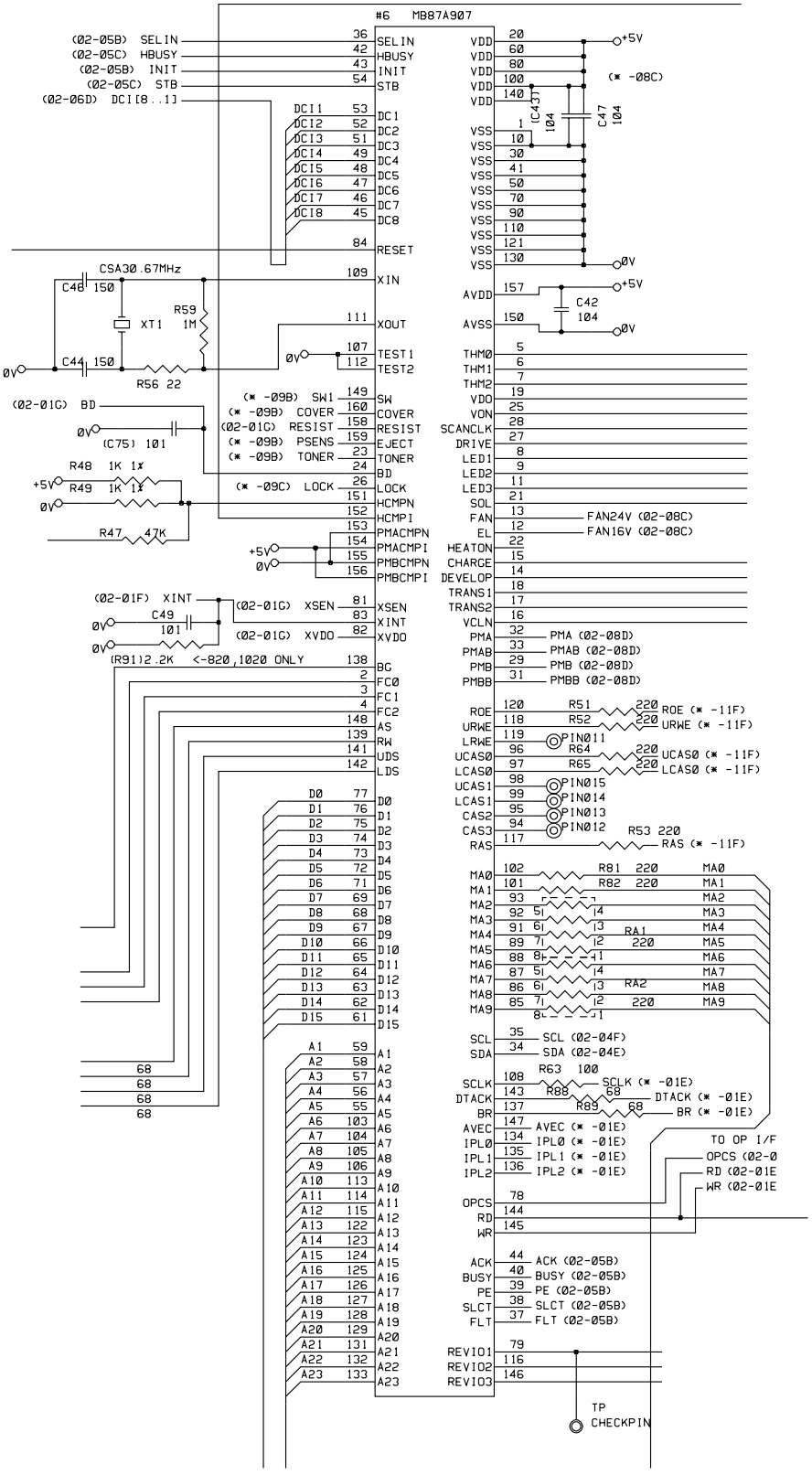


Fig. 2-9

HL-1050

The ASIC is composed of a Cell Based IC that contains the following functional blocks.

(1) Oscillator circuit

Generates the main clock for the CPU.

(2) Address decoder

Generates the CS for each device.

(3) DRAM control

Generates the $\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$, $\overline{OE}$ and MA signals for the DRAM and controls refresh processing (CAS before RAS self-refreshing method).

(4) Interrupt control

Interrupt levels:

Priority	High	10	Reserve interrupt 1 (for debug)
		9	Watch Dog Timer
		8	LSB EMPTY (for VDO FIFO)
		7	Timer 1
		6	USB
		5	XIO interrupt (RS-100M) or MIO interrupt
		4	BD (for engine check)
		3	Reserve interrupt 2
		2	CDCC
	Low	1	Timer 2

Note:

- *All the interrupts can be masked.*
- *The priority of levels 7, 6, and 5 are changeable from the program.*

(5) Timers

The following timers are incorporated:

Timer 1	32-bit timer
Timer 2	32-bit timer
Timer 3	Watch-dog timer

(6) FIFO

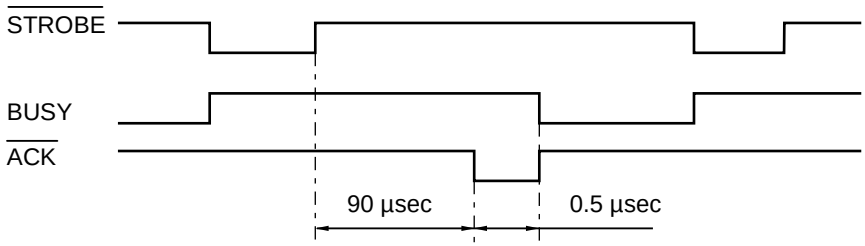
A 10Kbit FIFO is included. Data for one raster scan is transferred from the RAM to the FIFO by DMA transmission and is output as serial video data. The data cycle is 10.43MHz.

(7) Parallel I/O

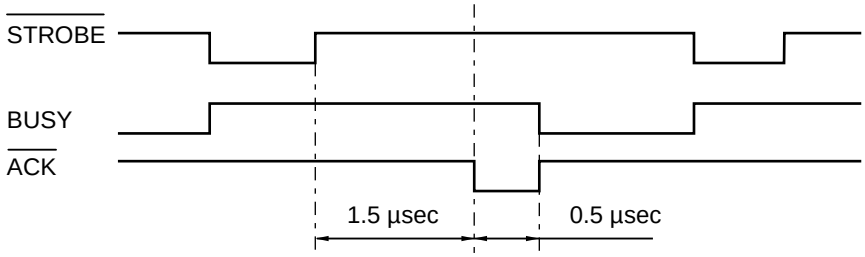
<Data receive Mode>

There are two modes in this unit. One is the CPU receive mode and the other is the DMA receive mode. In the CPU receive mode the CPU receives the command data from the PC, and after the CPU is switched to the DMA mode, it receives the image data and writes it to the DRAM directly.

CPU Receive Mode



DMA Receive Mode



BUSY goes HIGH at the falling edge of the STROBE signal. The data (8 bits) from the PC is latched into the data buffer at the rising edge of the STROBE signal. The pulse width of ACK varies according to the speed MODE as shown above. BUSY goes LOW on the rising edge of ACK.

<IEEE1284 support>

This supports the IEEE1284 data transfer with the following mode.

Nibble mode
Byte mode
ECP mode

(8) Data expansion

This circuit expands the compressed image data received from the PC, and writes the bit map data to the FIFO.

(9) Software support

Supports 16 x 16 rotation, bit expansion, bit search, and decimal point conversion.

(10) EEPROM I/O

One output port and one I/O port are assigned.

(11) Engine control I/O

This I/O is used for the connection to the panel sensor PCB. It controls the main motor, solenoid, sensors, etc.

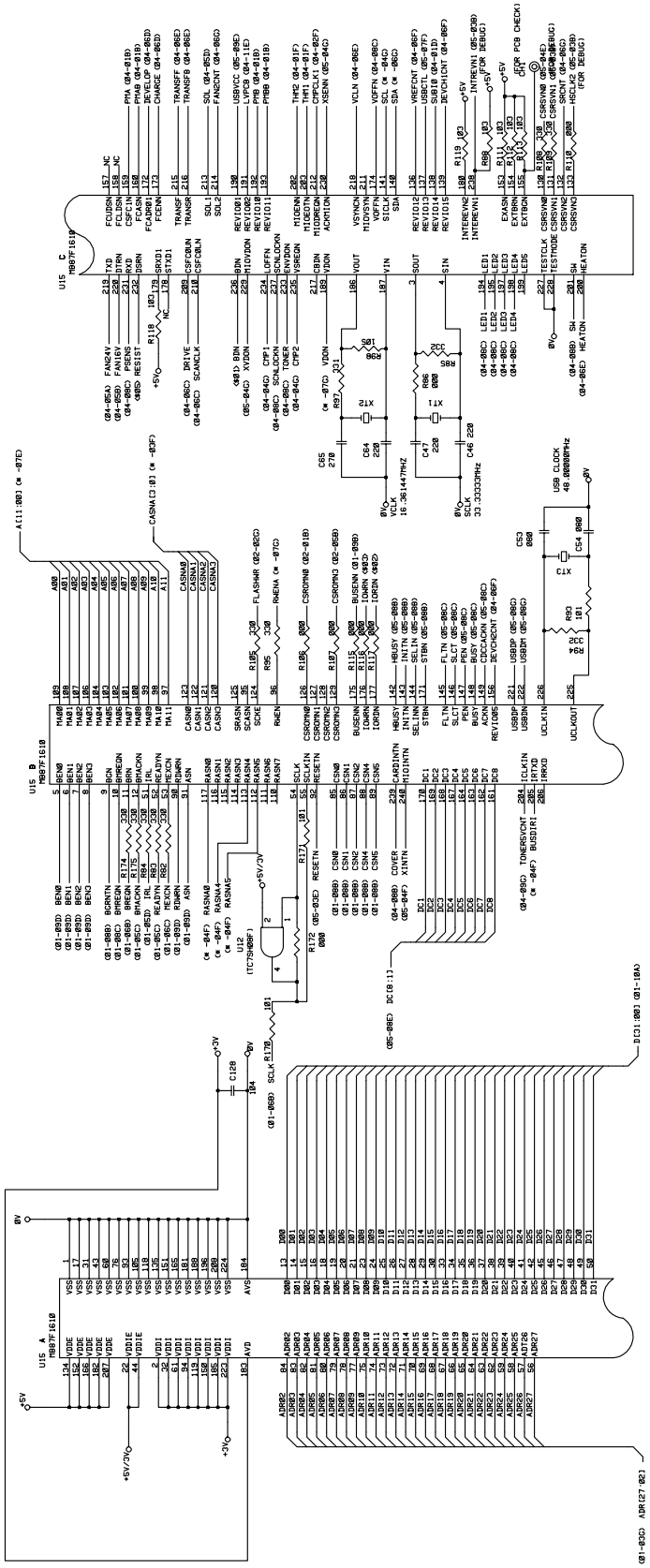


Fig. 2-10

1.3.3 ROM

HL-820/1020/1040

A program file of 512 Kbytes and the font data are stored in the ROM. A 42-pin IC socket is provided: a 16 Mbits ROM (42-pin) is mounted into this socket normally, but a 4 Mbits ROM (40-pin) can be mounted by leaving the 1st and 42nd pins of the socket open circuit.

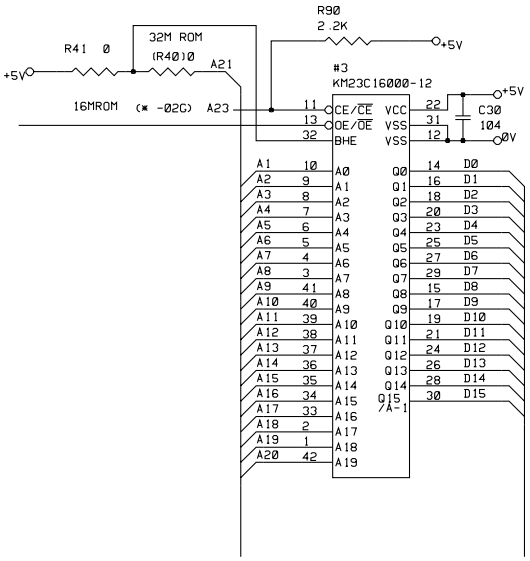


Fig. 2-11

HL-1050

A program file of 4.0 Mbytes and the font data are stored in the ROM. Two 42-pin IC sockets are provided: two 16 Mbits ROMs (42-pin) can be mounted into these sockets.

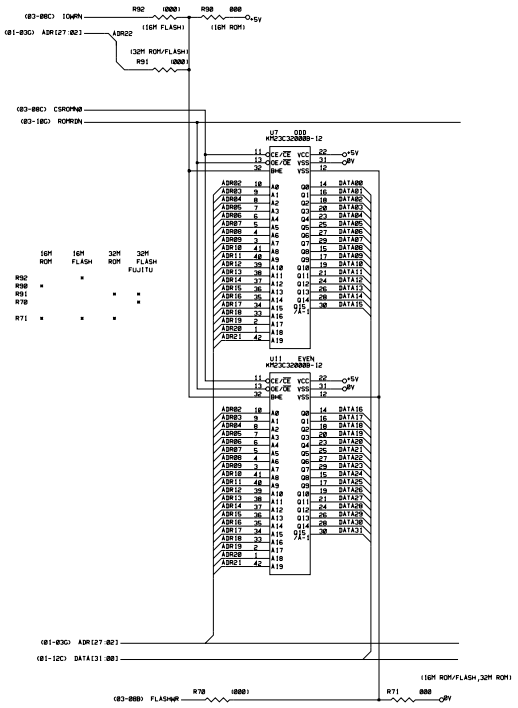


Fig. 2-12

1.3.4 DRAM

HL-820/1020/1040

A 16M-bit DRAM (x 16bits) is used as the RAM.

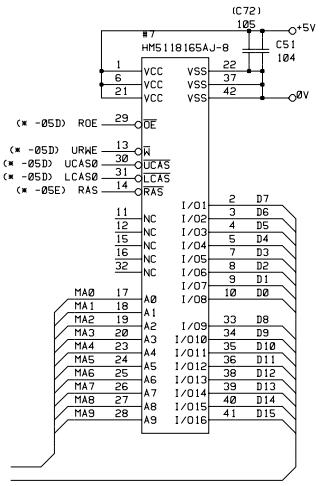


Fig. 2-13

HL-1050

Two 16M-bit DRAMs (x 16bits) are used as the RAM.

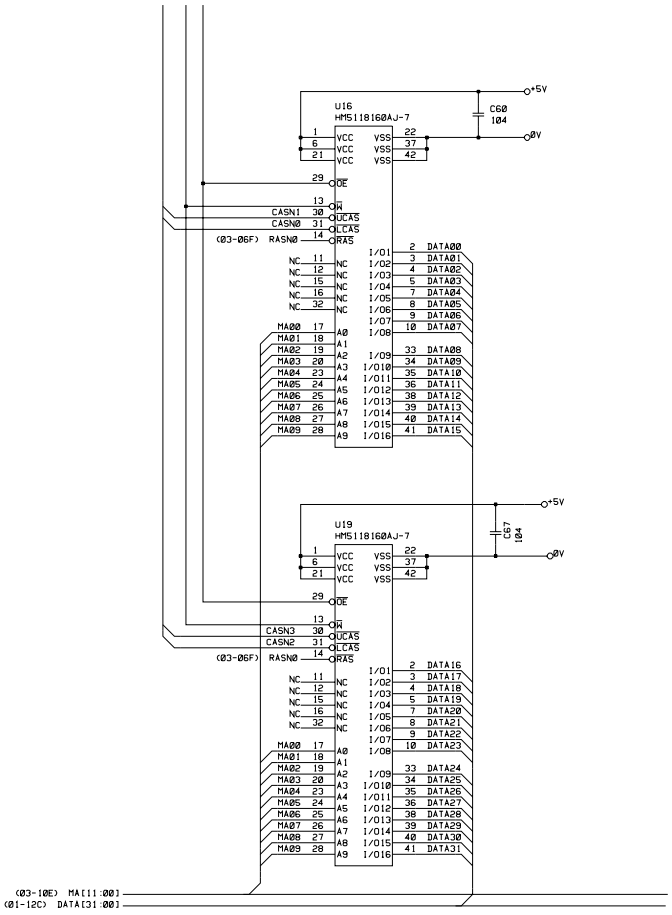


Fig. 2-14

1.3.5 Optional RAM

HL-1050

A 32bit (72 pin) SIMM can be fitted as optional RAM. The main PCB has one slot and the capacity of SIMM can be from 1 Mbyte to 32 Mbytes.

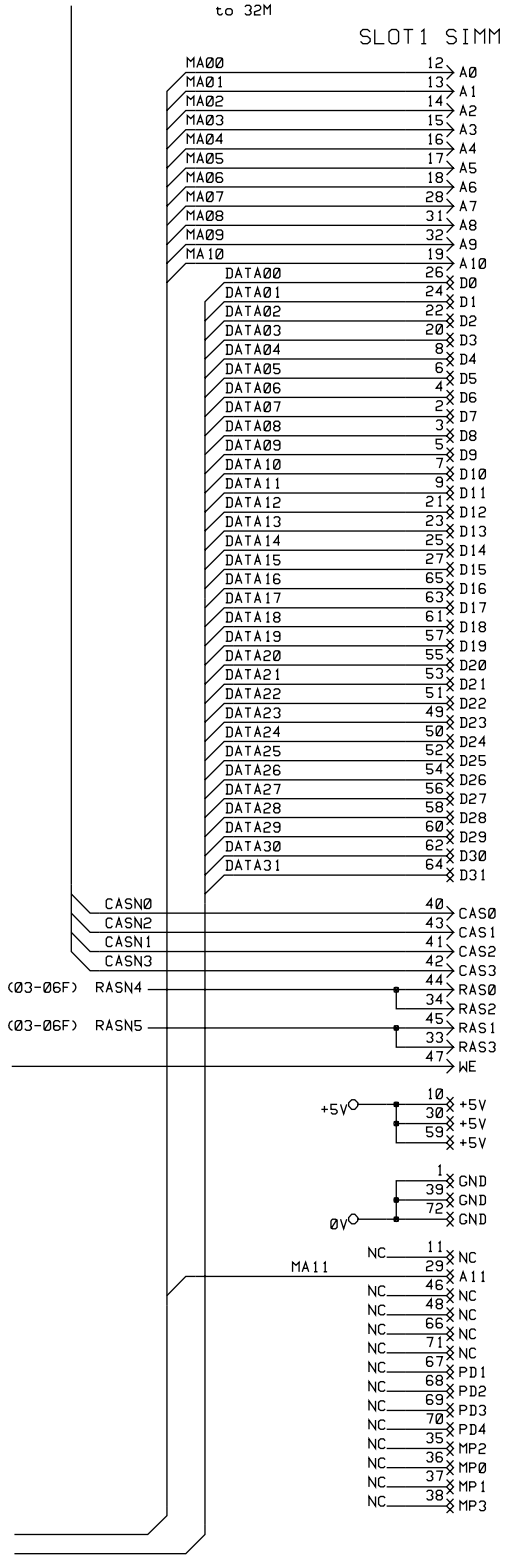


Fig. 2-15

1.3.6 Optional Serial I/O

HL-1040/1050

The interrupt of the serial I/O is input to the EXINT terminal of the ASIC, and is recognized by the CPU. A 32-byte register is provided for this I/O, which is read and written to by the CPU.

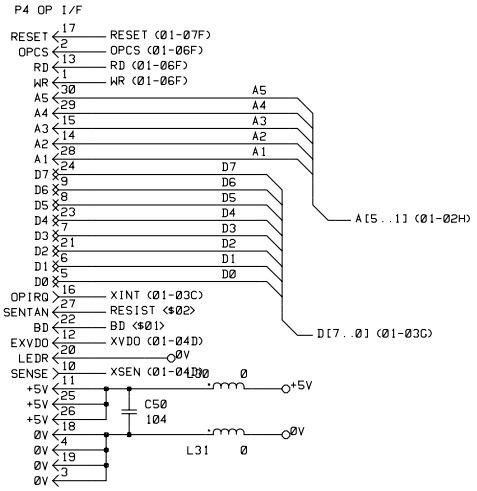


Fig. 2-16

1.3.7 EEPROM

HL-820/1020/1040

The EEPROM is an XL24C01AF type of two-wire method with a 128 x 8 bits configuration.

M62320FP is an IC which transfers the data received from the serial I/O to the parallel I/O.

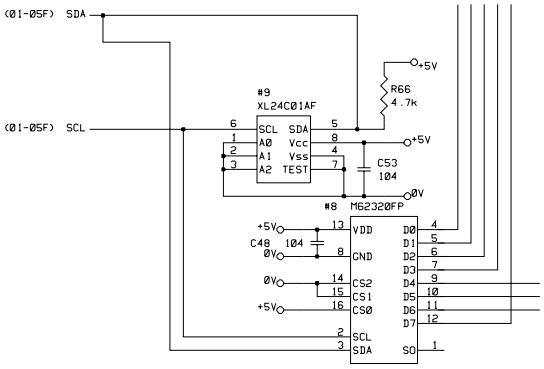


Fig. 2-17

HL-1050

The EEPROM is XL24C04AF type of two-wire method with a 512 x 8 bits configuration.

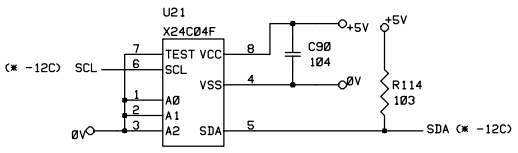


Fig. 2-18

1.3.8 Reset Circuit

HL-820/1020/1040

The reset IC is a PST598DNR. The reset voltage is 4.2V (typ.) and the LOW period of reset is 200ms (typ).

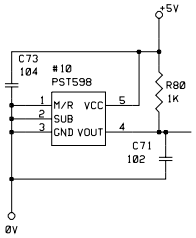


Fig. 2-19

HL-1050

The reset IC is a PST596DNR. The reset voltage is 4.2V (typ.) and the LOW period of reset is 50ms (typ).

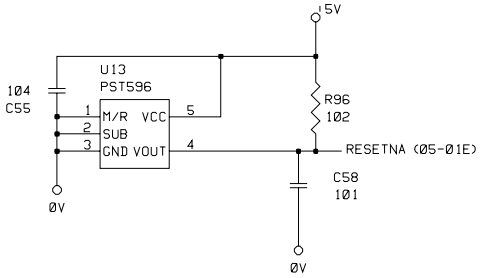


Fig. 2-20

1.3.9 CDCC I/O

HL-820/1020/1040

Fig. 2-21 shows the CDCC interface circuit.

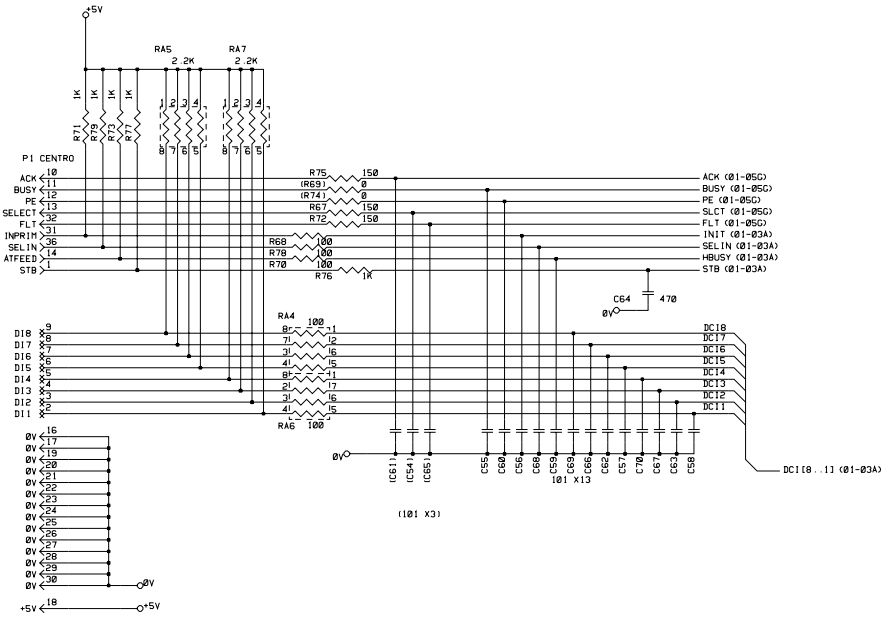


Fig. 2-21

Fig. 2-22 shows the CDCC interface circuit.

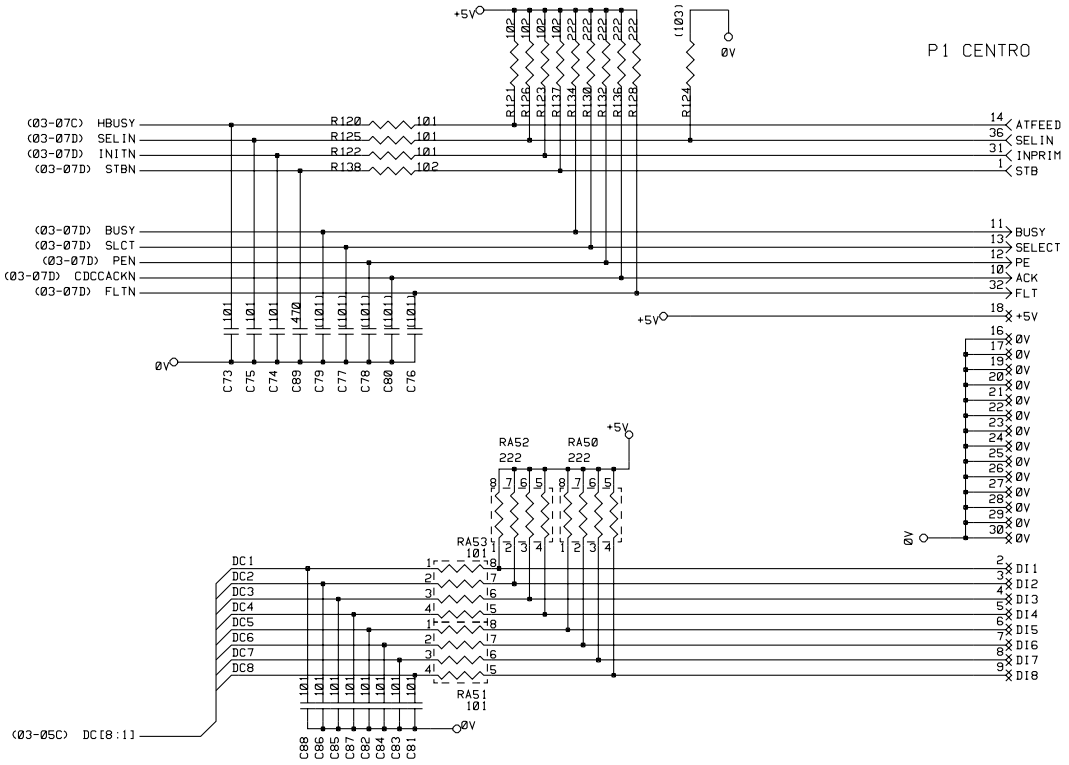


Fig. 2-22

1.3.10 Engine I/O

HL-820/1020/1040

Fig. 2-23 shows the engine interface circuit.

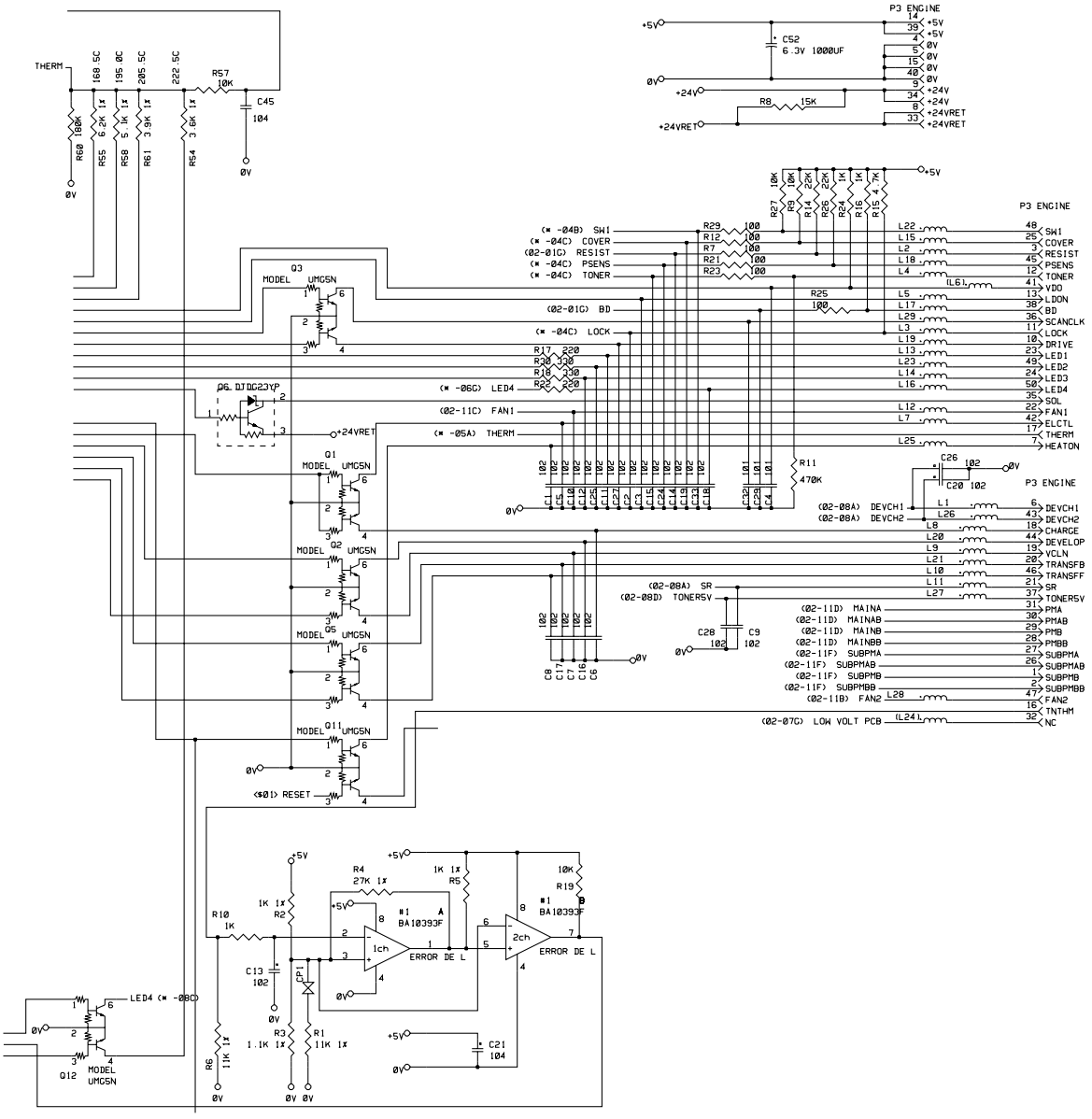


Fig. 2-23

Fig. 2-24 shows the engine interface circuit.

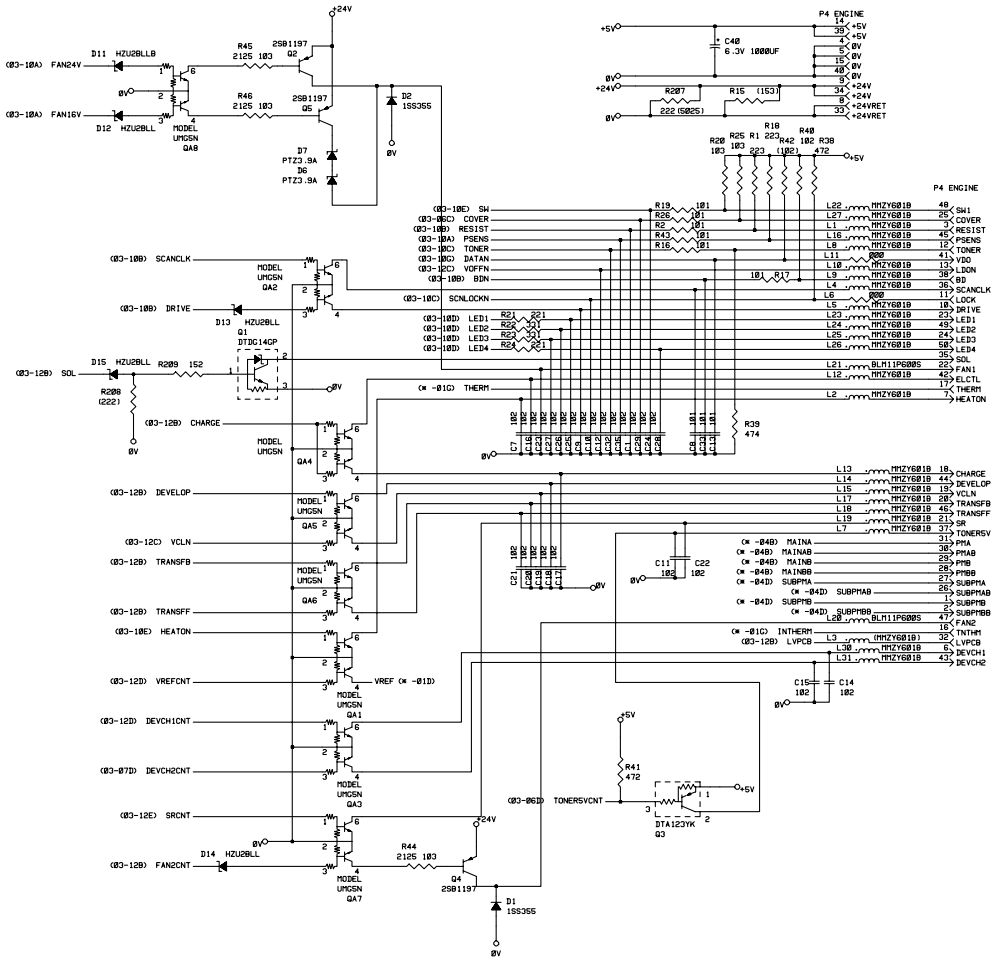


Fig. 2-24

1.3.11 Paper Feed Motor Drive Circuit

HL-820/1020/1040

The motor driver is a TR array. The excitation method is 2-2 phase excitation with a bipolar drive.

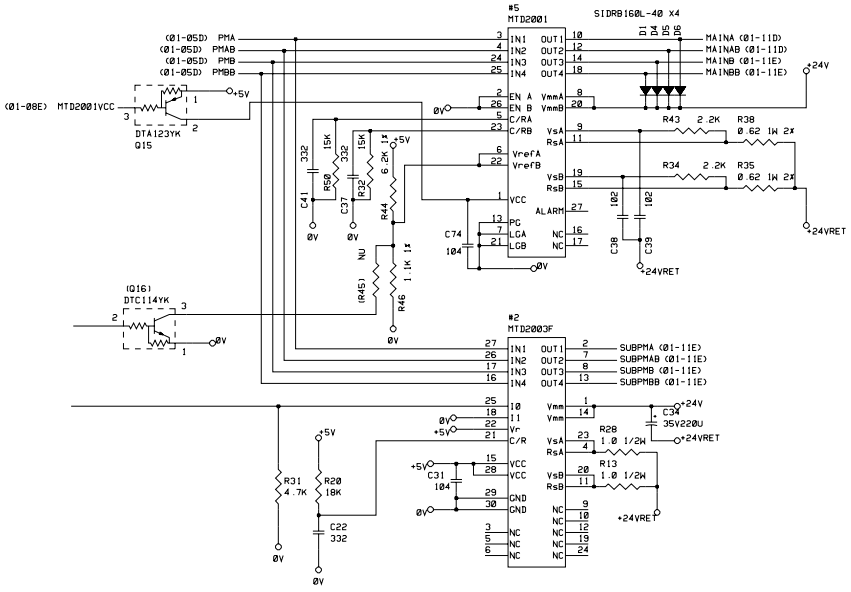


Fig. 2-25

HL-1050

The motor driver is a TR array. The excitation method is 2-2 phase excitation with a bipolar drive.

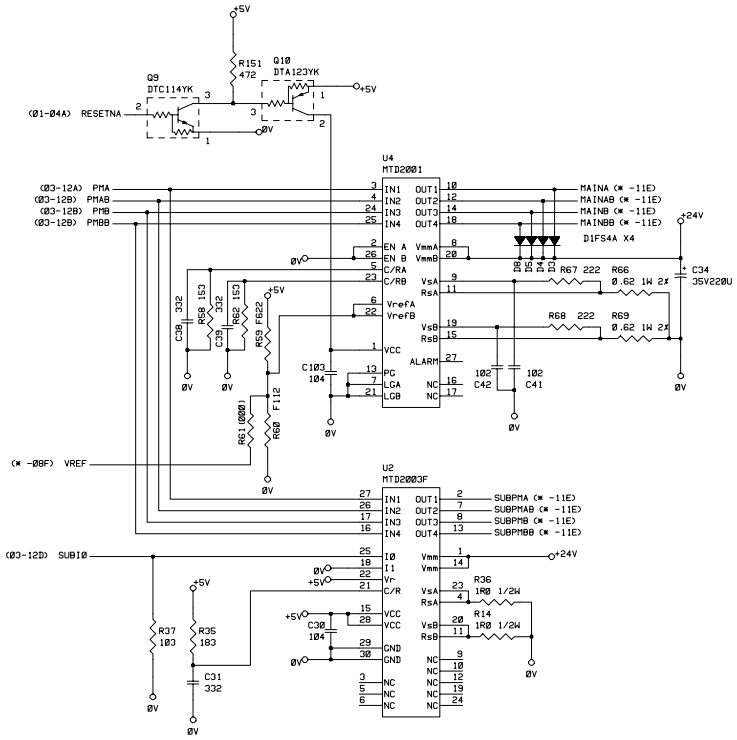


Fig. 2-26

1.4 Panel Sensor PCB

The following parts are on the panel sensor.

- Control Panel ..... 1 Switch, 4 lamps
- Connector ..... Low-voltage, high-voltage, solenoid, main motor, toner sensor, laser, polygon motor, connector for main PCB
- Registration sensor

1.5 Power Supply

1.5.1 Low-voltage Power Supply

The power supply uses a switching regulation system to generate the regulated DC power (+5V and +24V), which are converted from the AC line.

The regulated output and the production code of each power supply vary depending on the printer model as listed below;

Model	Regulated Output	Production Code
HL-820/1020/1040	+5V / 0.6 A +24V / 2.0 A	100V: MPW1547 200V: MPW1447
HL-1050	+5V / 1.2A +24V / 2.0A	100V: MPW1550 200V: MPW1450

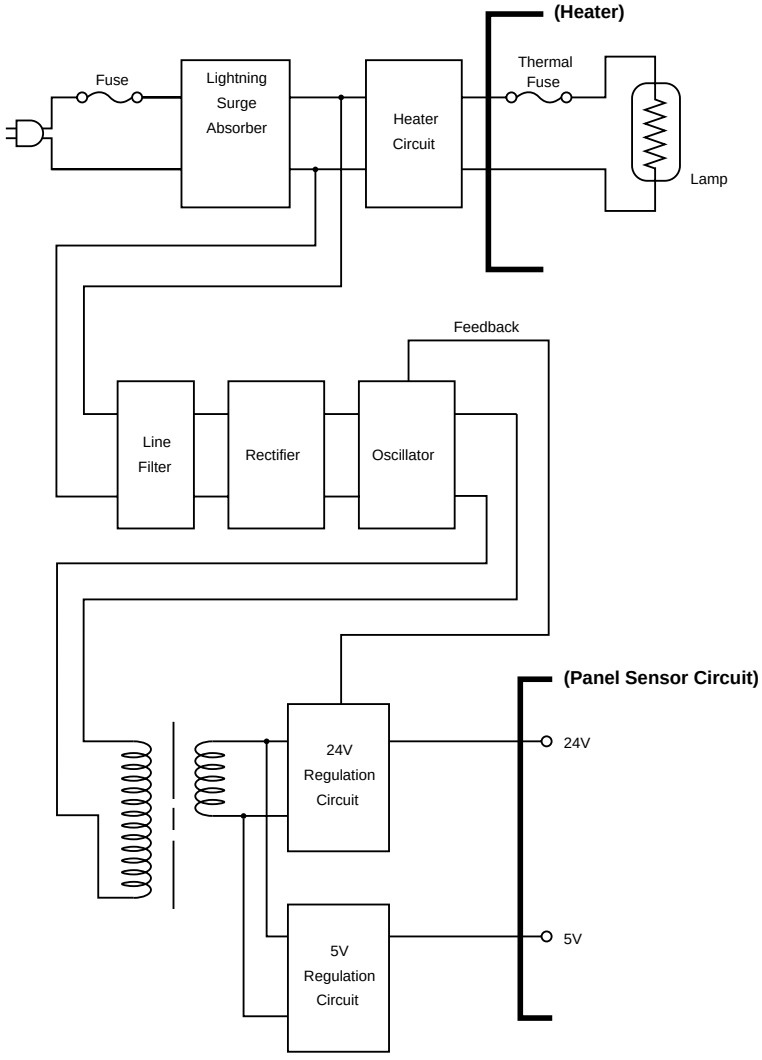


Fig. 2-27

1.5.2 High-voltage Power Supply

This generates and outputs the voltages and currents for the charging, development and transfer functions.

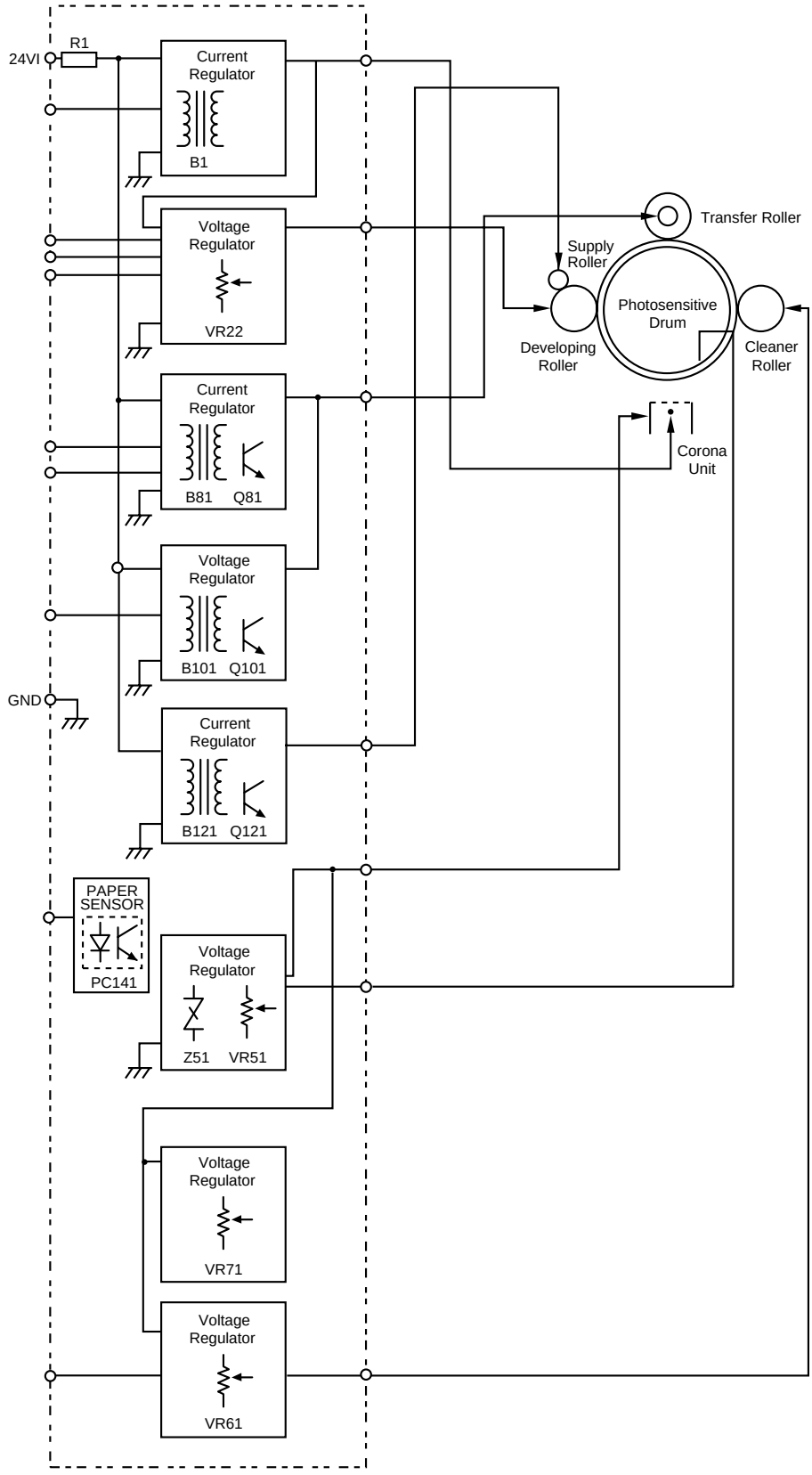


Fig. 2-28

2. MECHANICS

2.1 Overview of Printing Mechanism

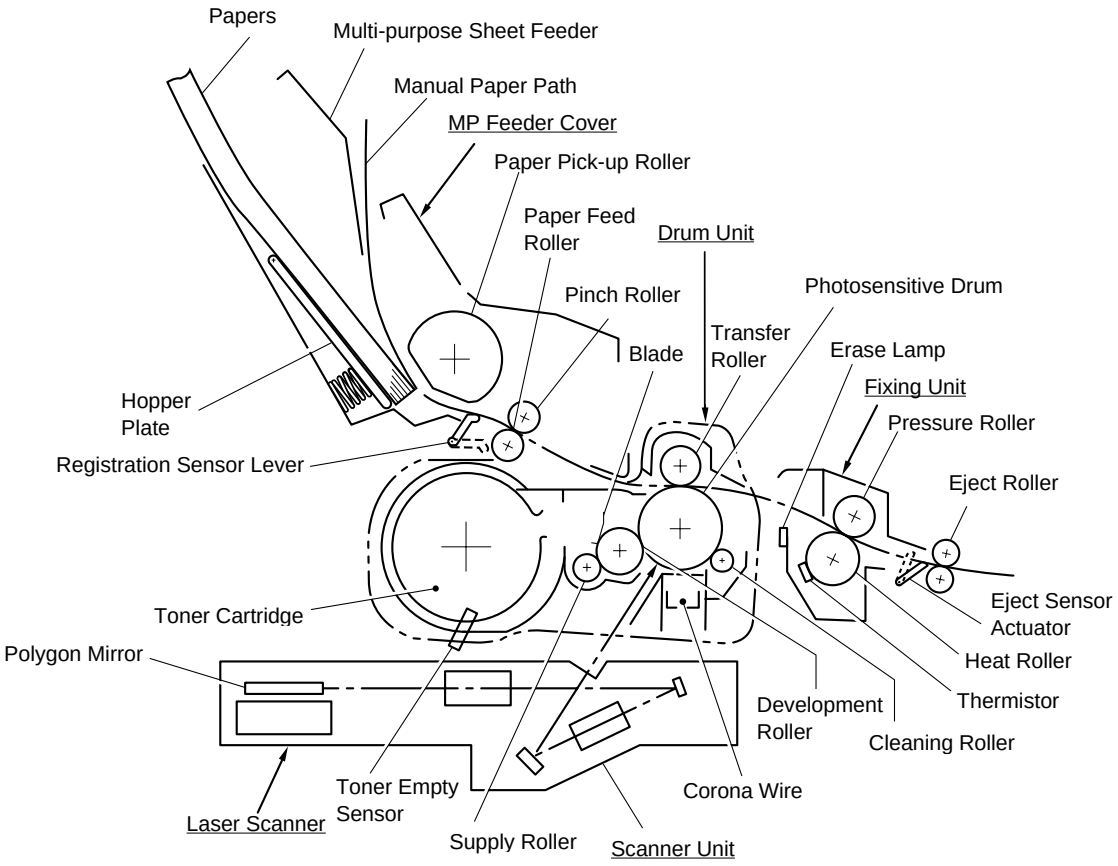


Fig. 2-29

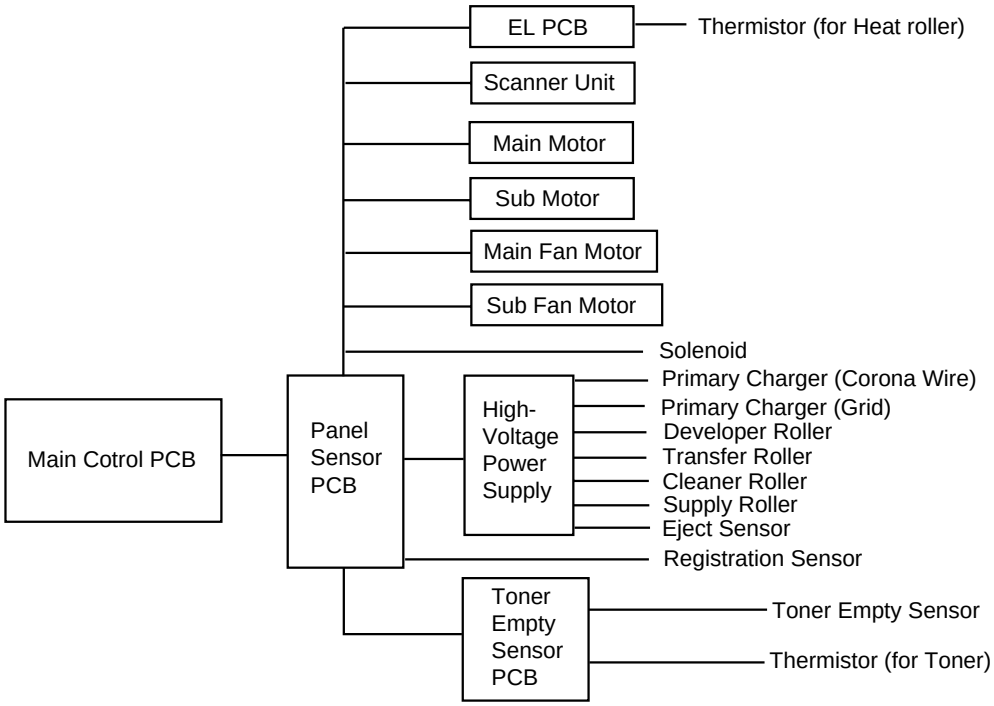


Fig. 2-30

2.2 Paper Transfer

2.2.1 Paper Supply

The pick-up roller picks up one sheet of paper from the paper feeder every time it is rotated and feeds it to the paper feed roller.

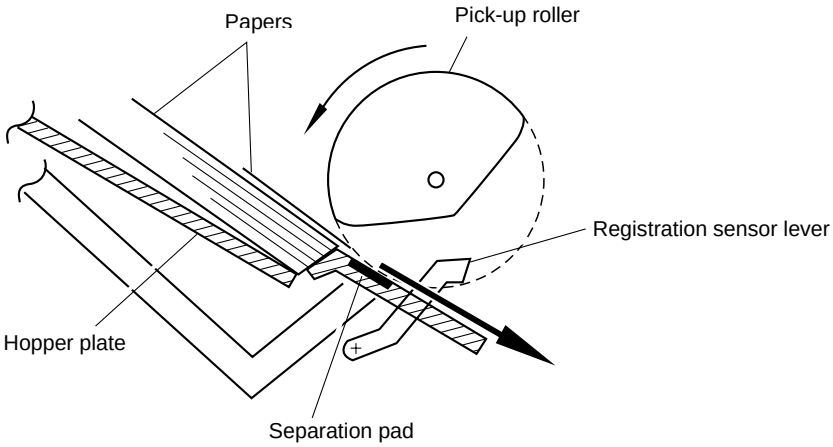


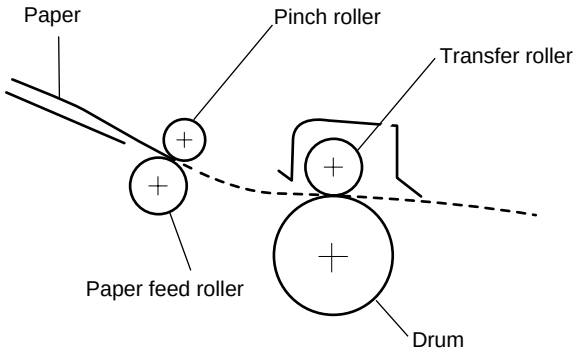
Fig. 2-31

The paper is gripped between the pick-up roller and the separation pad and separated into individual sheets.

The pick-up roller is directly connected to the sector gear, whose rotation is forcibly stopped by the gear stopper. When the pick-up solenoid is activated, the clutch mechanism is engaged by the solenoid action and the sector gear is driven; when it has completed one full turn its rotation is stopped again by the gear stopper. The paper drawn out by the pick-up roller pushes against the top of form sensor lever and the paper top position/absence of paper is detected by sensing the motion of the lever.

2.2.2 Paper Registration

When paper picked up from the multi-purpose sheet feeder (MPF) pushes against the top of form sensor actuator, the registration sensor lever is caused to turn, and the photo sensor detects this motion. When this signal from the sensor is detected the paper feed roller is stopped temporarily by the clutch. The paper is fed to the nip point between the paper feed roller and the pinch roller in the multi-purpose sheet feeder, and the skew of the paper is corrected by pushing the leading edge of the paper against the nip point. When the paper feed roller starts to be rotated again when it is released by the clutch, paper with the leading edge correctly aligned, is fed by the paper feed roller and is transported to the transfer roller.



Clutch mechanism (engaged/released by the solenoid assembly)
Released when the solenoid is ON and engaged when the solenoid is OFF.

Fig. 2-32

2.2.3 Paper Eject

The completion of paper eject is detected in the following manner:

(a) When the leading edge of the paper pushes down the eject sensor actuator located in the fixing unit, the photo sensor (photo interrupter) is opened and detects the start of paper eject.

(b) When the trailing edge of the paper has passed through the paper eject sensor actuator, the photo sensor is closed and the completion of paper eject is recognized.

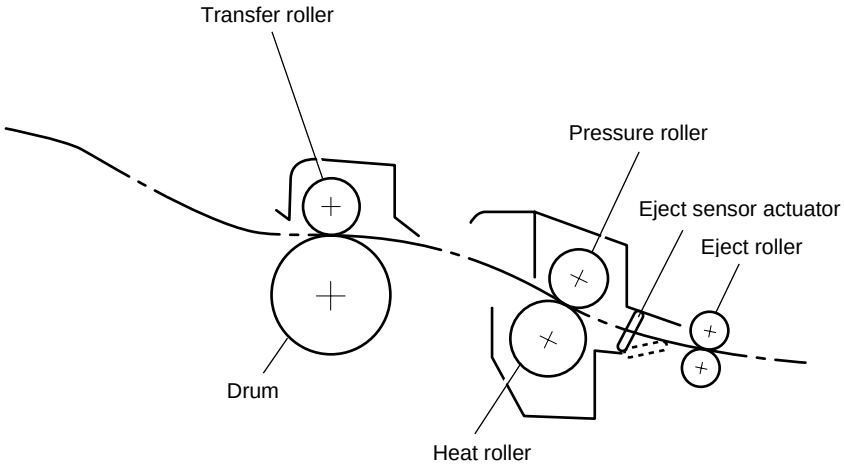


Fig. 2-33

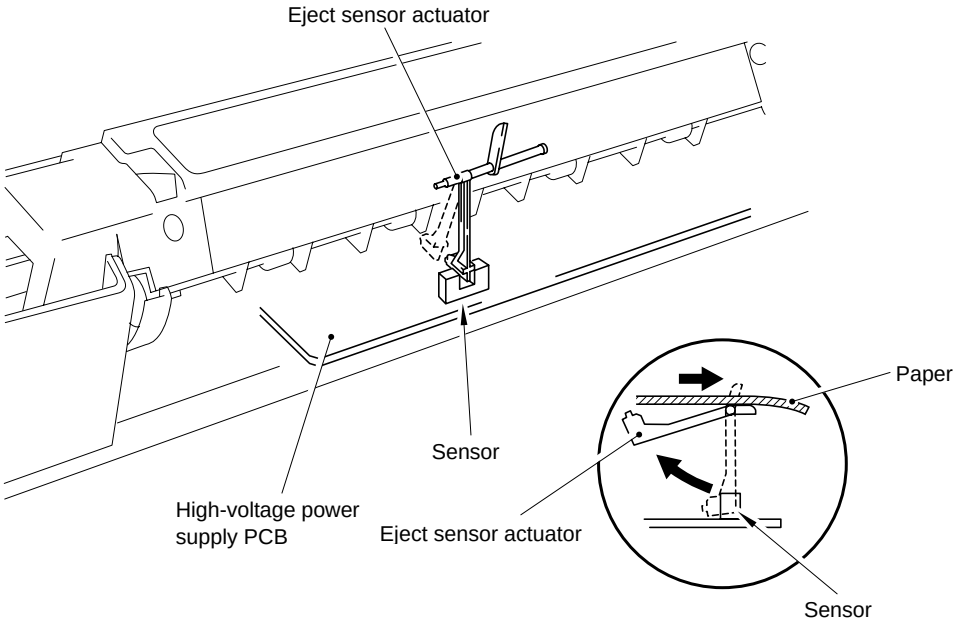


Fig. 2-34

2.3 Sensors

2.3.1 Cover Sensor

Detects opening and closing of the top cover.

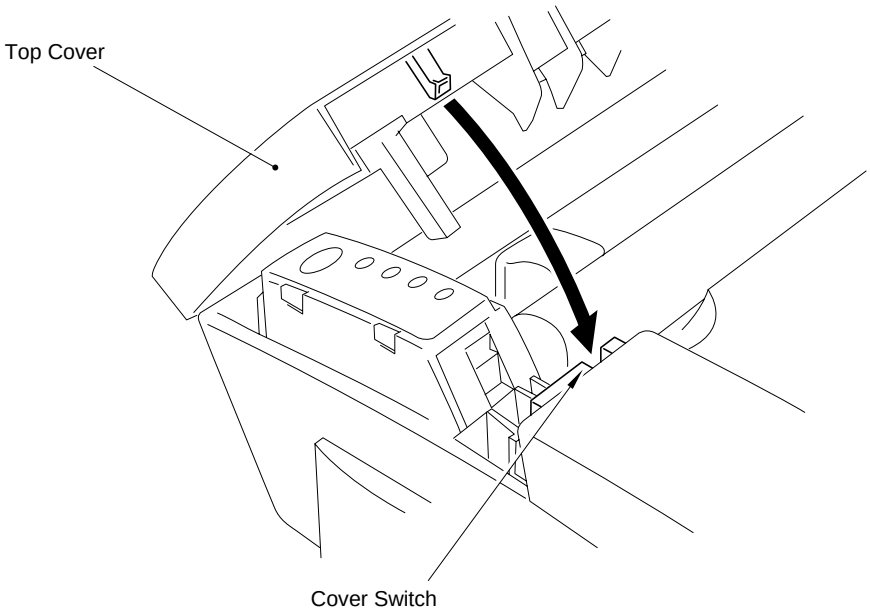


Fig. 2-35

2.3.2 Toner Empty Sensor

Detects if there is toner in the toner cartridge. It also detects whether or not the drum unit is installed. (The toner cartridge is installed in the drum unit).

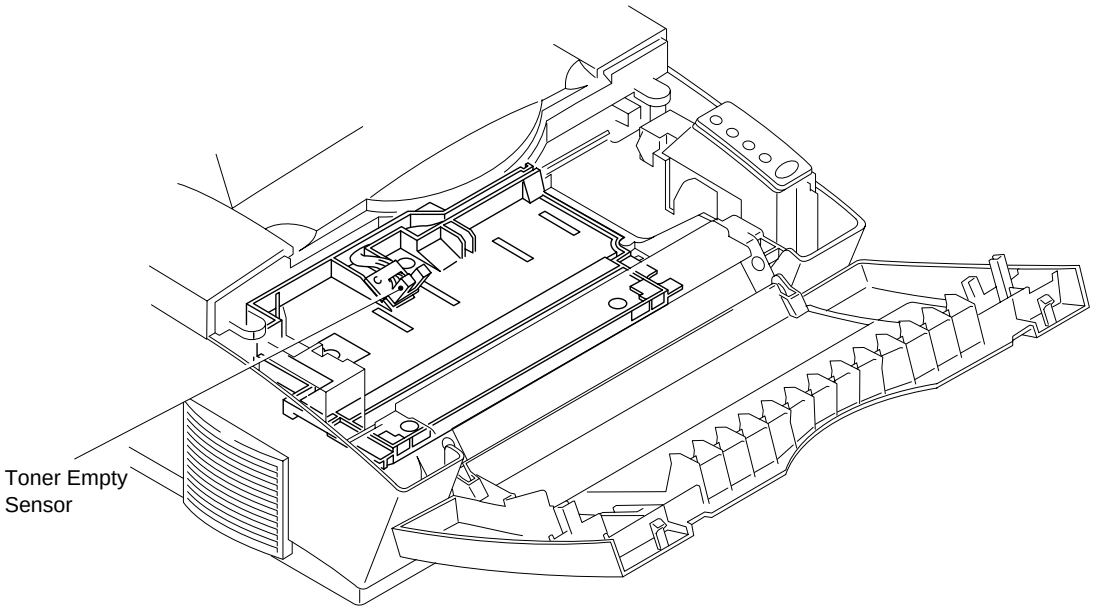


Fig. 2-36

2.4 Drum Unit

2.4.1 Photosensitive Drum

Generates the latent electrostatic image and develops the image on the drum surface.

2.4.2 Primary Charger

Forms a uniform charge on the drum surface.

(1) Corona wire
Generates the ion charge on the drum.

(2) Grid
Spreads the ion charge evenly over the drum surface.

2.4.3 Development Roller

Develops the latent electrostatic image on the drum surface by the addition of the toner.

2.4.4 Transfer Roller

Transfers the toner image to the paper from the drum surface.

2.4.5 Cleaner Roller

Removes and recycles the toner remaining on the drum surface.

2.4.6 Erase Lamp

Discharges the electrostatic latent image on the drum.

2.5 Print Process

2.5.1 Charging

The drum is charged to approx. +1150V by an ion charge which is generated by the primary charger. The charge is generated by ionization of the corona wire, which has a DC bias from the high-voltage power supply applied to it. The flow of the ion charge is controlled by the grid to ensure it is distributed evenly on the drum surface. The drum sleeve is regulated to approx. 280V by the voltage regulator.

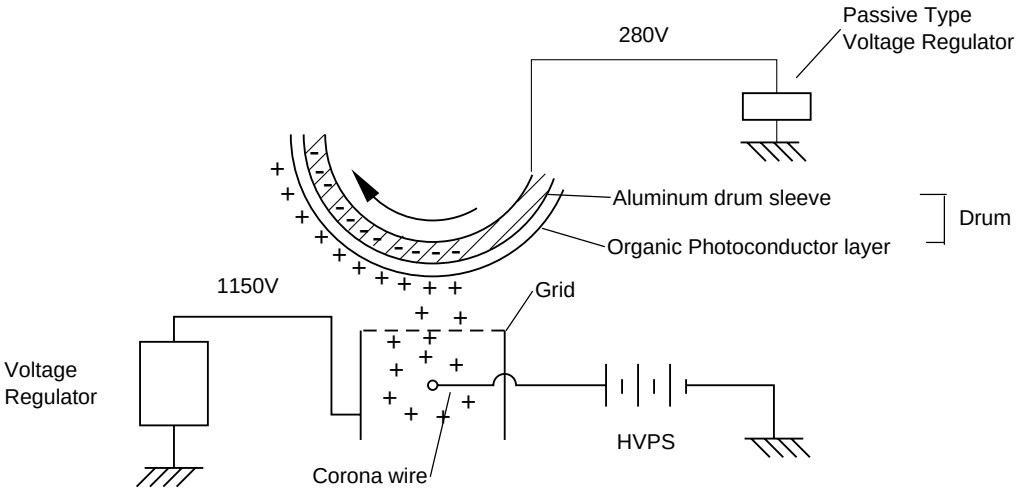


Fig. 2-37

The primary charge uses a corona wire, but since the drum is positively charged, only less than 1/10 of the usual quantity of ozone is generated compared with the negatively charged drum. The level of ozone expelled from the printer is therefore not harmful to the human body. Applicable safety standards have been complied with.

2.5.2 Exposure Stage

After the drum is positively charged, it is exposed to the light emitted from the laser unit.

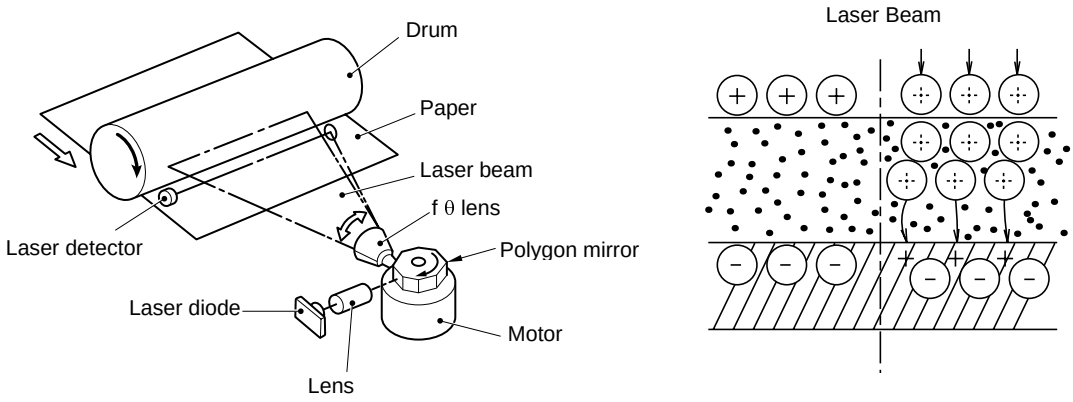
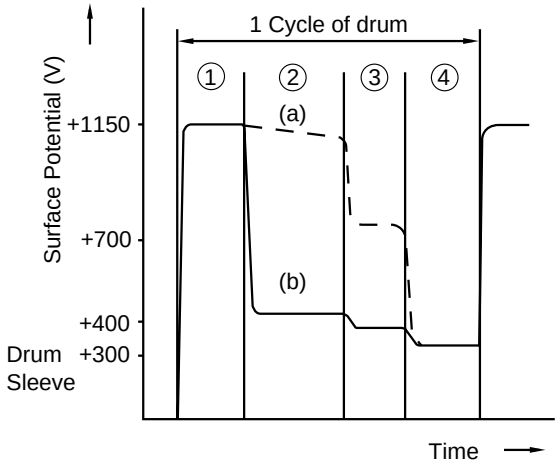


Fig. 2-38

The area exposed to the laser beam is the image to be printed. The surface potential of the exposed area is reduced, forming the electrostatic image to be printed.



① Primary charging

② Laser beam exposure and developing
(a) Unexposed area
(Non image area)
(b) Exposed area
(Image area)

③ Transfer the image to paper

④ Erase the residual potential

Fig. 2-39

2.5.3 Developing

Developing causes the toner to be attracted to the electrostatic image on the drum so as to transform it into a visible image.

The developer consists of a non-magnetic toner. The development roller is made of conductive rubber and the supply roller (which is also made of conductive sponge) rotate against each other. The toner is charged and carried from the supply roller to the development roller. The toner adheres to the development roller and is conveyed to the drum at an even thickness controlled by the blade. The toner is nipped between the development roller and the drum and developed onto the latent image on the drum. The electrostatic field between the drum and the development roller, which is DC-biased from the high-voltage power supply, creates the electrostatic potential to attract toner particles from the development roller to the latent image area on the drum surface.

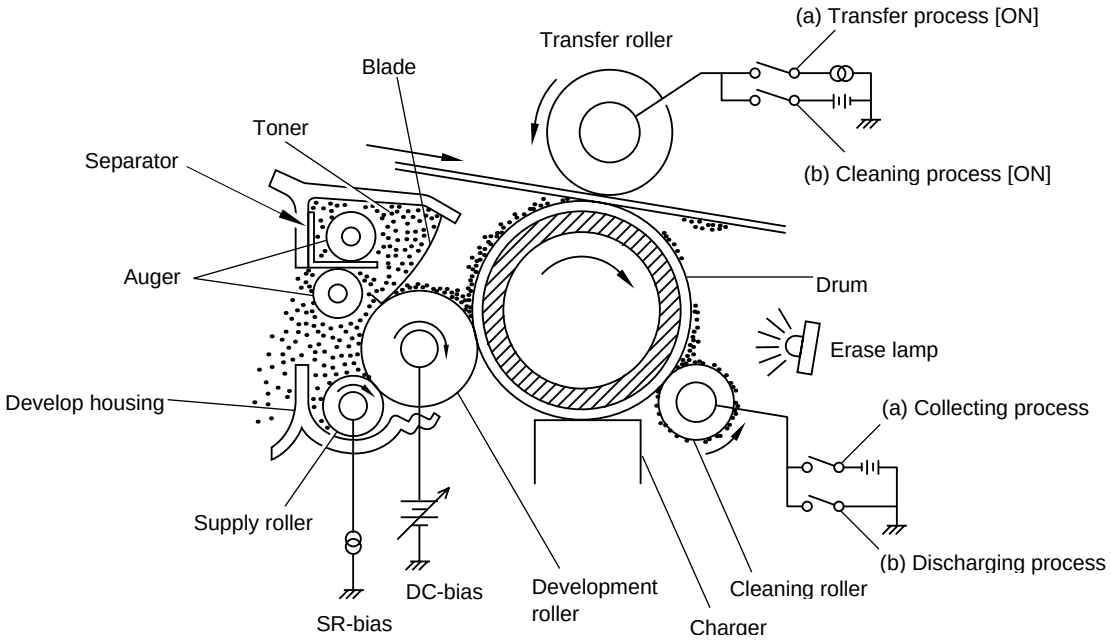


Fig. 2-40

2.5.4 Transfer

(a) Transfer process

After the drum has been charged and exposed, and has received a developed image, the toner formed is transferred onto the paper by applying a negative charge to the back of the paper. The negative charge applied to the paper causes the positively charged toner to leave the drum, and adhere to the paper. As a result, the image is visible on the paper.

(b) Cleaning process of transfer roller

If the toner is not transferred onto the paper perfectly, it is possible that there may be residual toner on the drum which will adhere to the transfer roller. The transfer voltage changes to a positive voltage during non-printing rotation of the drum. Therefore the transfer roller is cleaned by returning the positively charged toner adhering to the transfer roller onto the photo-conductive drum.

2.5.5 Drum Cleaning Stage

In the image transfer stage, not all the toner on the photosensitive drum is transferred onto the paper but some remains on the drum. In the drum cleaning stage, the drum surface is cleaned by the cleaning roller, so that residual toner on the drum surface is removed and collected on the cleaning roller itself. The residual toner on the cleaning roller will be discharged to the drum during starting or non-printing time. The toner will be collected by the developing roller and reused (for further developing).

2.5.6 Erasing Stage

Before the cleaning stage, the drum surface is exposed to the light emitted from the erase lamp (LED lamp). This stage prepares the drum by decreasing its surface voltage uniformly, ready to receive a uniform charge in the primary charging stage.

2.5.7 Fixing Stage

The image transferred to the paper by static electricity is fixed by heat and pressure when passing through the heat roller and the pressure roller in the fixing unit. The thermistor ASSY keeps the surface temperature of the heat roller constant by detecting the surface temperature of the heat roller and turning on or off the halogen heater lamp.

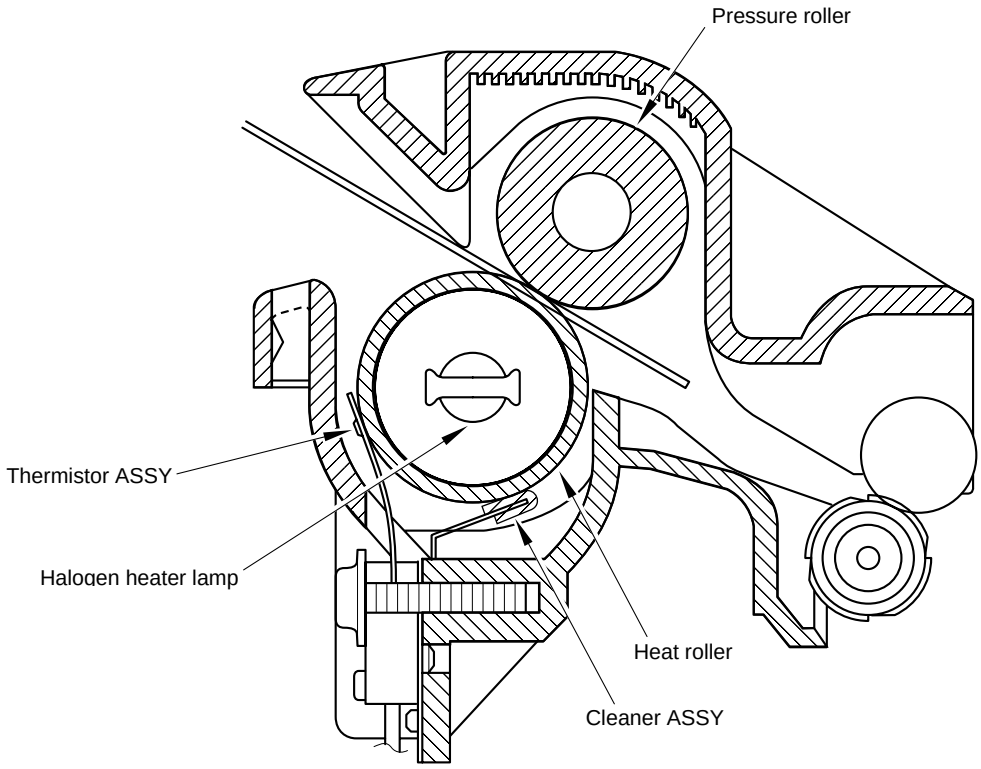


Fig. 2-41

CHAPTER III DISASSEMBLY AND REASSEMBLY

1. SAFETY PRECAUTIONS

To avoid creating secondary problems by mishandling, be careful to follow the following precautions during maintenance work.

(1) Always turn off the power switch and unplug the power cord from the power outlet before accessing any parts inside the printer.

(2) Be careful not to lose screws, washers, or other parts removed.

(3) Be sure to apply grease to the gears and applicable positions specified in this chapter.

(4) When using soldering irons or other heat-generating tools, take care not to accidentally damage parts such as wires, PCBs, and covers.

(5) Before handling any PCBs, touch a metal portion of the equipment to discharge any static electricity charge on your body, or the electronic parts or components may be damaged.

(6) When transporting PCBs, be sure to wrap them in the correct protective packaging.

(7) Be sure to replace self-tapping screws correctly, if removed. Unless otherwise specified, tighten screws to the following torque values.

TAPTITE, BIND or CUP B
M3 : 7kgf • cm
M4 : 10kgf • cm

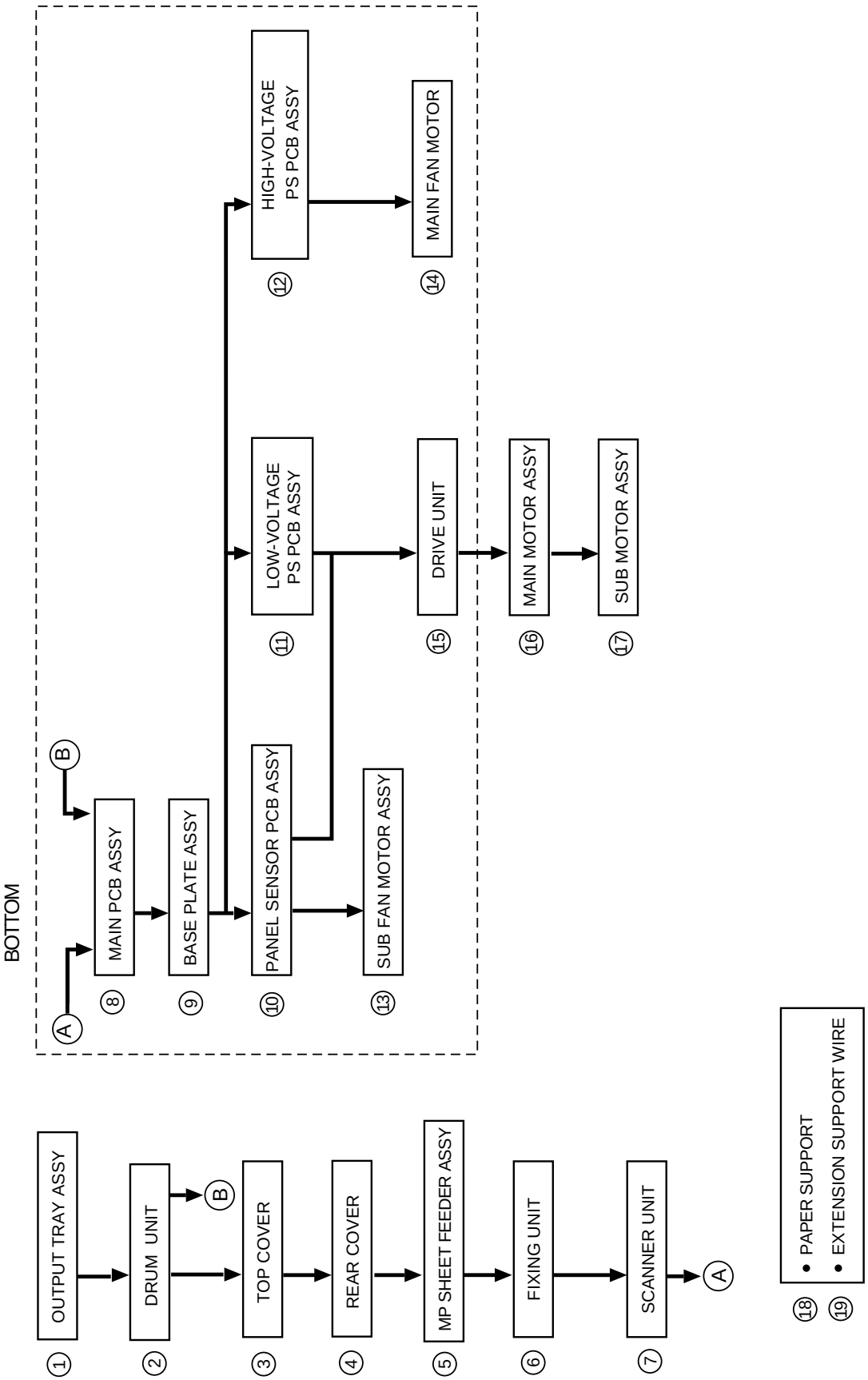
TAPTITE, CUP S
M3 : 8kgf • cm

SCREW
M3 : 7kgf • cm
M4 : 8kgf • cm

(8) When connecting or disconnecting cable connectors, hold the connector body, not the cables. If the connector has a lock, release the connector lock first to release it.

(9) After a repair, check not only the repaired portion but also all connectors. Also check that other related portions are functioning properly before operational checks.

2. DISASSEMBLY FLOW



3. DISASSEMBLY PROCEDURE

3.1 Output Tray ASSY

(1) Open the output tray toward you.

(2) Press the hinges at the left and right sides of the output tray inwards to release the output tray from the main cover.

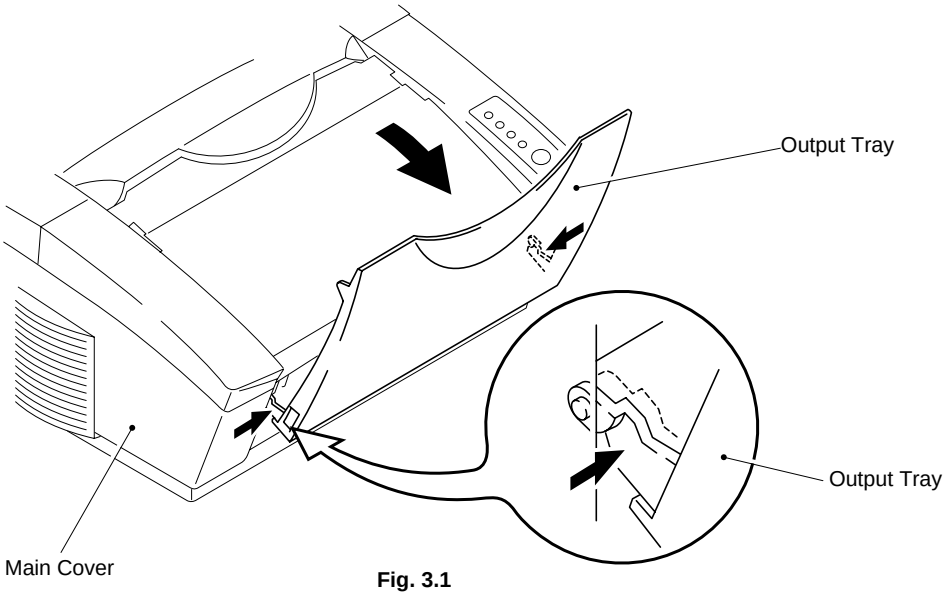


Fig. 3.1

3.2 Drum Unit

(1) Open the top cover.

(2) Lift out the drum unit.

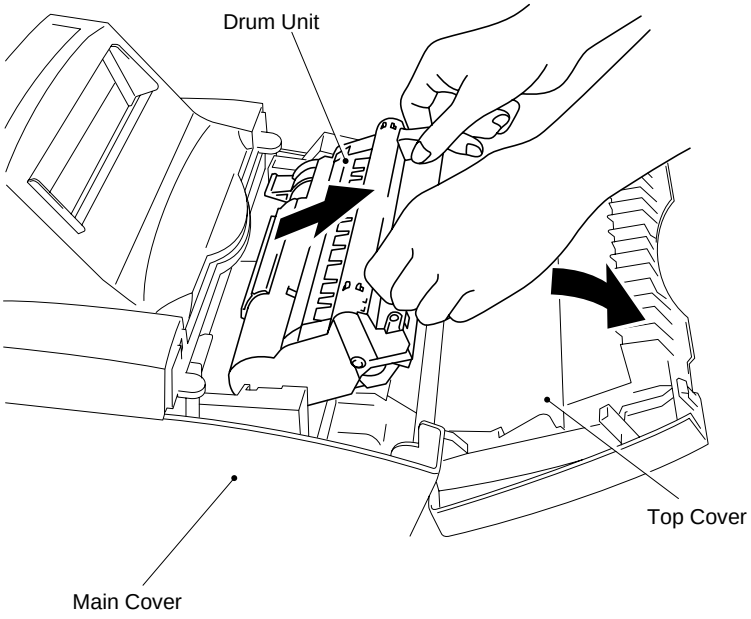


Fig. 3.2

3.3 Top Cover

(1) Open the top cover.

(2) Press the hinges at the left and right sides of the top cover inwards to release the top cover from the main cover.

Note:
It is recommended for easy removal to press the side of the top cover (①) while pulling the side of the main cover (②).

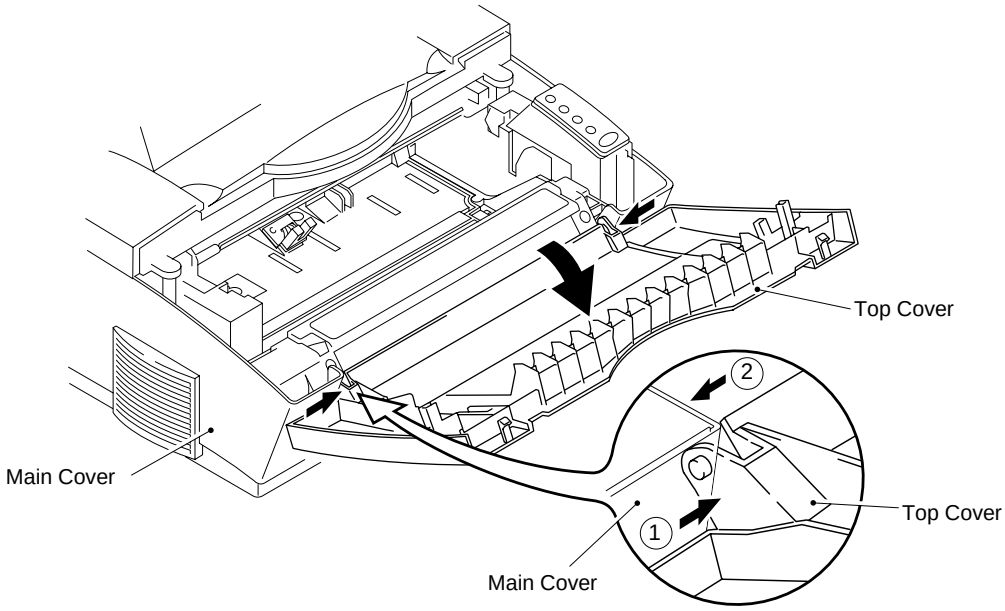


Fig. 3-3

3.4 Rear Cover

(1) Remove the two M4x12 tapping screws.

(2) Remove the rear cover.

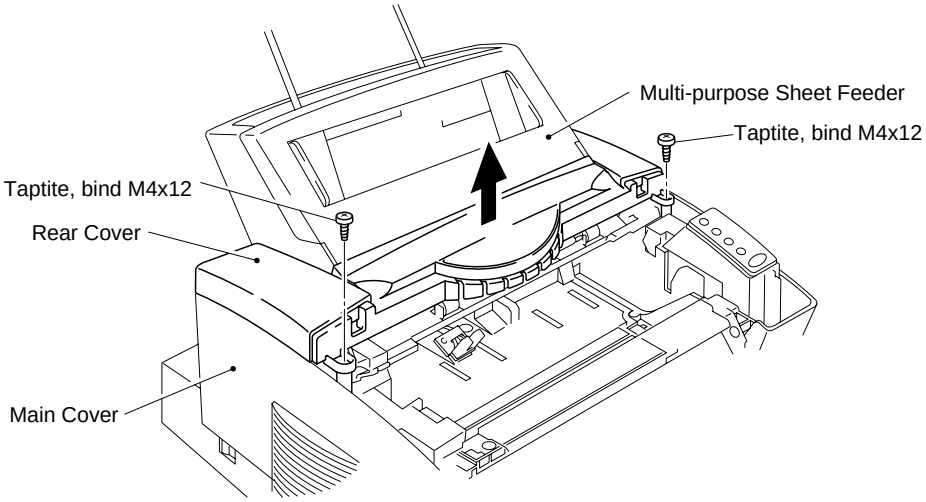


Fig. 3-4

Note:
When re-assembling the rear cover, hook the two hooks at the right and left hand side (rear), then secure the two screws.

3.5 MP Sheet Feeder ASSY

Caution:
When disassembling the MP sheet feeder ASSY, if you get the grease on your fingers, take care not to touch the separation pad or the paper pick-up roller, the grease spread to the paper and the drum unit. It might cause black spots to appear on the printed page.

(1) Push the left rib outwards and pull out the MP sheet feeder. It is not necessary to release the right rib.

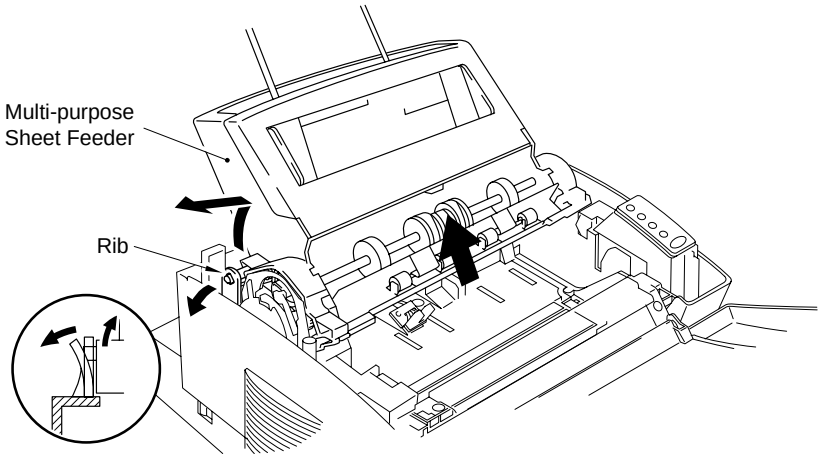


Fig. 3-5

Note:
When re-assembling, apply a suitable amount of grease (2 rice-grain size) between the heat sink of the motor and the ground leaf spring in case of grease shortage. (Refer to the figure below.)

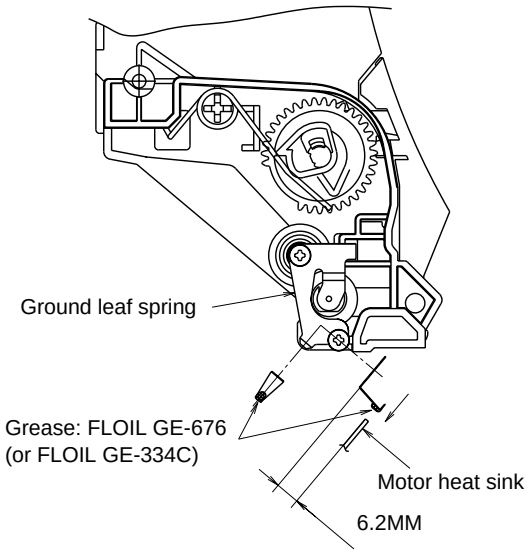


Fig. 3-6

3.6 Fixing Unit

(1) Remove the two M4x16 tapping screws.

(2) Lifting the fixing unit, disconnect the thermistor connector on the EL PCB first, then the two heater harnesses.

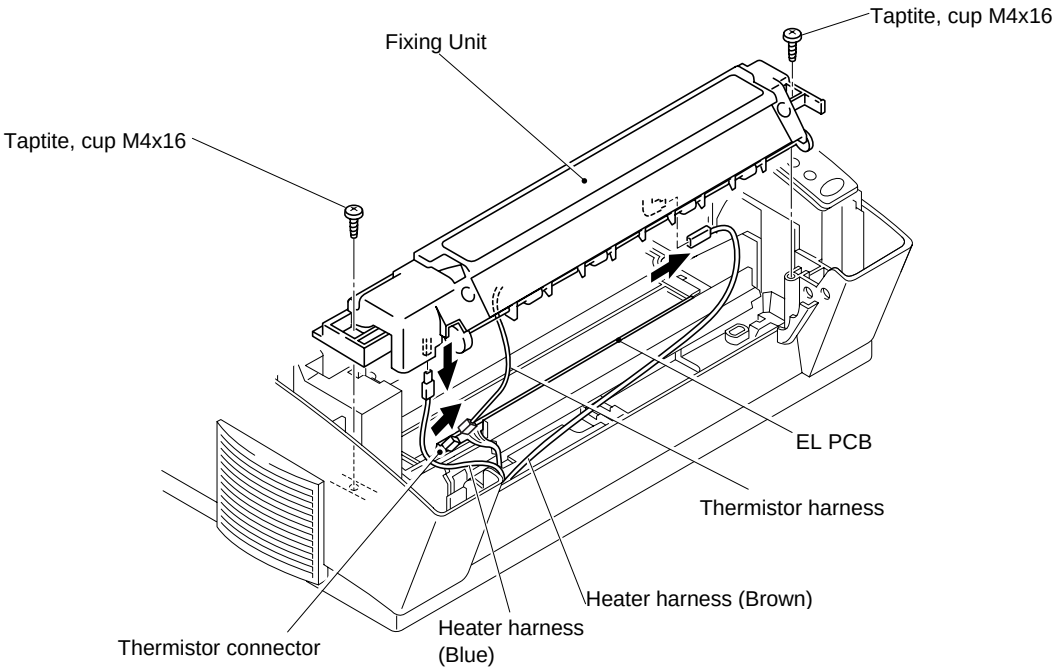


Fig. 3-7

Note:
The eject sensor actuator may also be removed when removing the fixing unit. In this case be sure to re-assemble the eject sensor actuator when re-assembling the fixing unit.

(3) Remove the two M3x12 tapping screws.

(4) Open the fixing unit cover along the open side of the fixing unit cover.

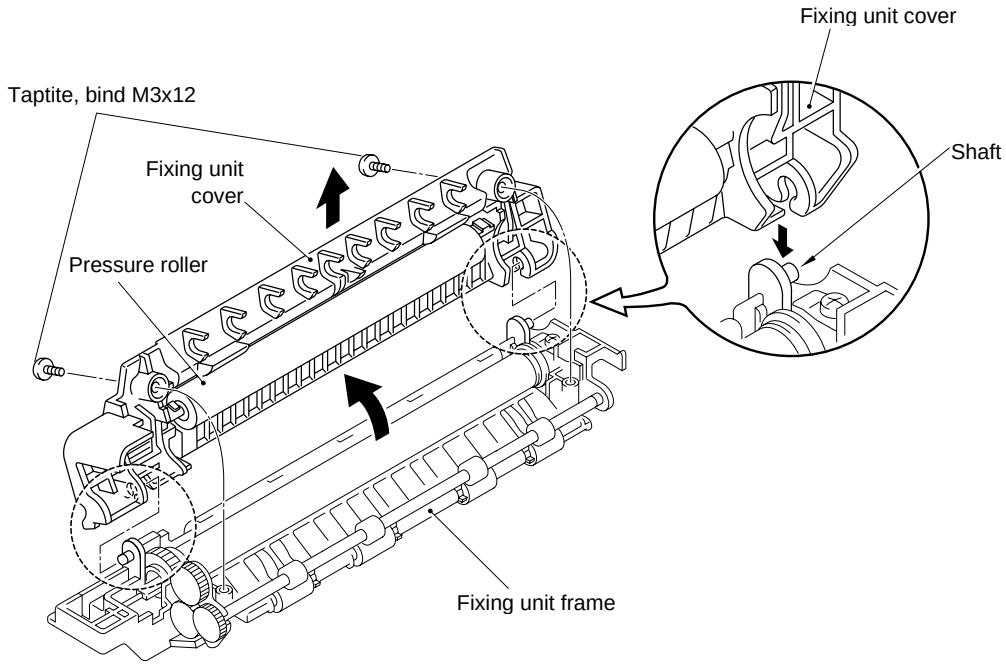


Fig. 3-8

(5) Release the right side of the paper eject roller shaft.

(6) Remove the four eject pinch rollers and the pinch springs from the fixing unit frame. Then, remove the pinch spring from each pinch roller.

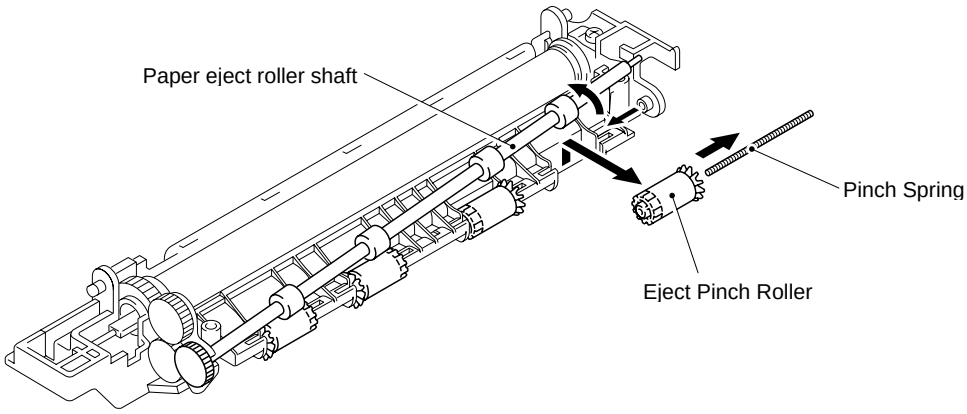


Fig. 3-8a

(7) Remove the M3x10 self tapping screw securing the connector plate.

(8) Remove the connector plate from the fixing unit frame and loosen the other M3x10 tapping screw securing the fixing unit cover.

(9) Remove the idle gear 16 from the fixing unit frame to remove the heat roller. Then, remove the halogen heater lamp from the heat roller.

Caution :
Never touch the surface of the halogen heater lamp and the heat roller.

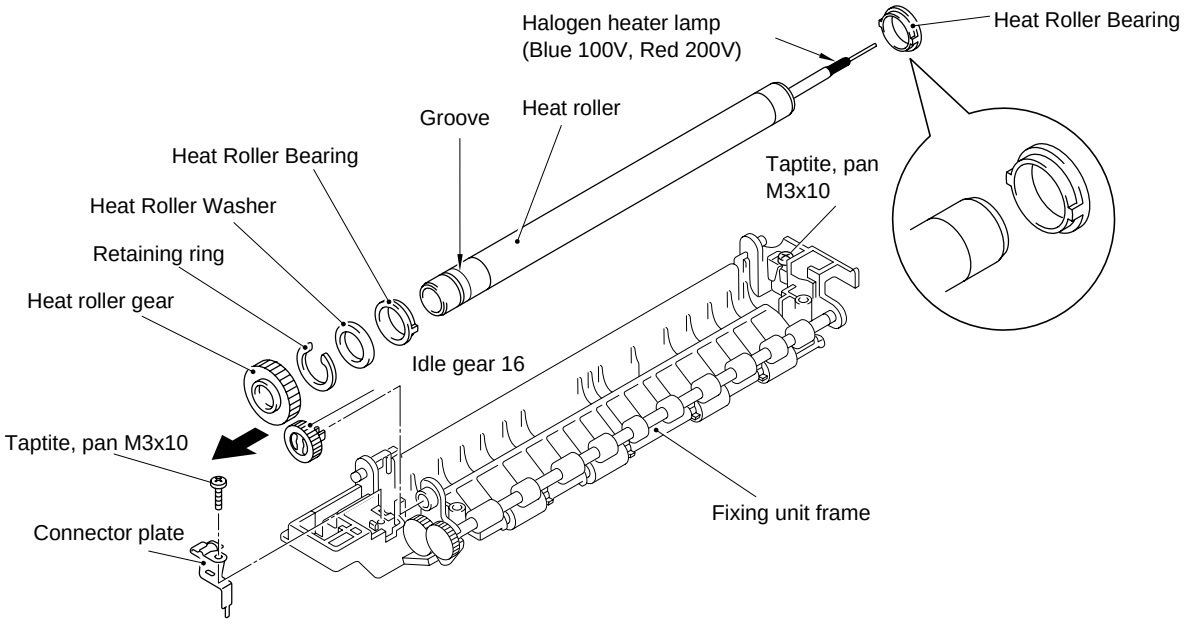


Fig. 3-9

Note:

- *When re-assembling the bearing at the both ends of the heat roller, ensure that the direction of the bearing is correct referring to the above figure.*
- *The heat roller itself is very similar to the one for HL-1060/1070 printers. The heat roller for the HL-820/1020/1040/1050 printers can be distinguished by the groove on the edge of the roller. (Refer to the above figure.)*

- *When replacing the heat roller cleaner with a new one, attach the cleaner referring to the figure below;*

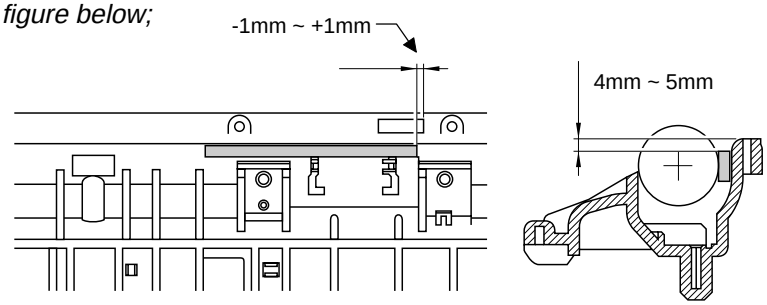


Fig. 3-10

- *Follow the instructions below when installing the thermistor in the fixing unit.*
  i) Place the cleaner felt of the cleaner ASSY for the thermistor under the heat roller.
  ii) Place the end of the thermistor on the heat roller.
  iii) Insert boss1 of the thermistor into the hole of the fixing unit frame.
  iv) Do no place the thermistor on boss2 of the fixing unit frame.

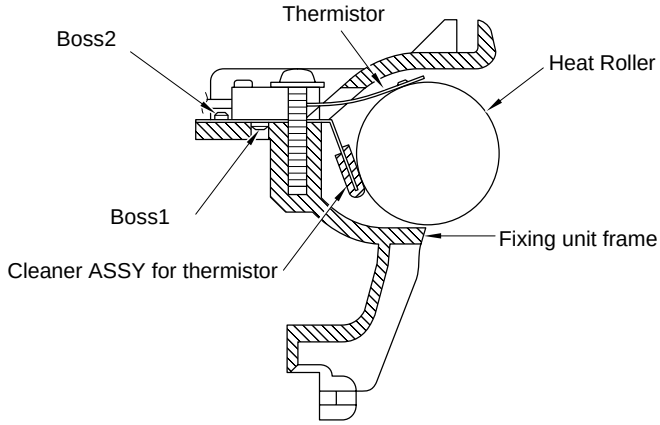


Fig. 3-11

3.7 Scanner Unit

(1) Remove the three M4x12 tapping screws.

(2) Lift out the scanner unit.

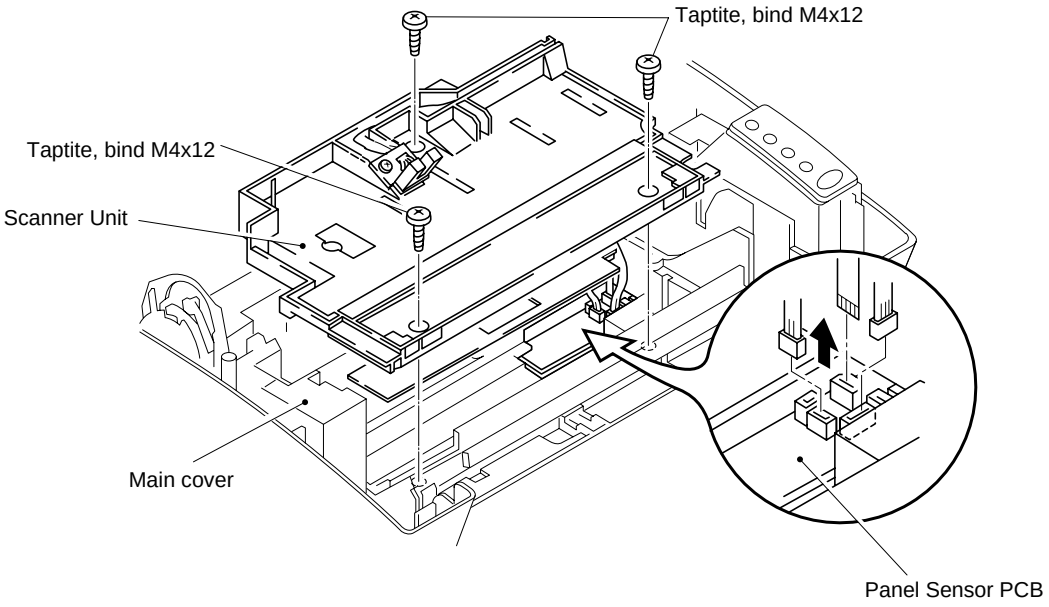


Fig. 3-12

Note:
When replacing the scanner unit, ensure to assemble the ferrite core using the cable binder as follows;

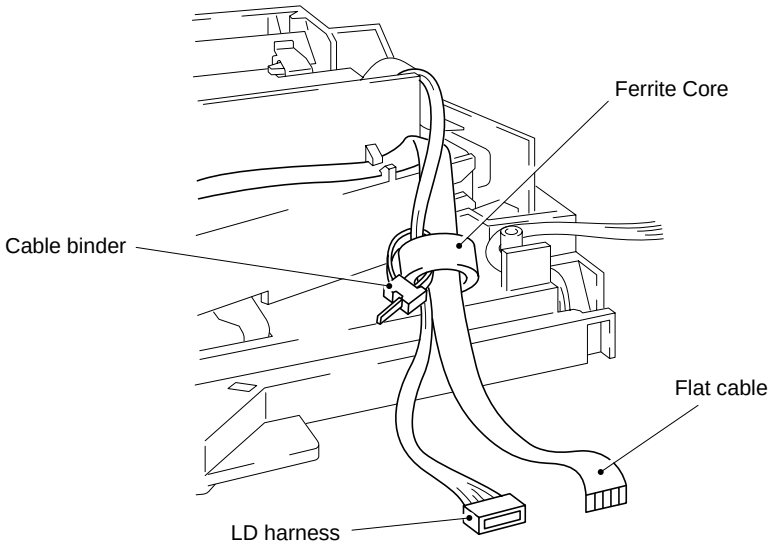


Fig. 3-13

(3) Disconnect the three connectors from the panel sensor PCB.

(4) Remove the M3x8 tapping screw, and lift the toner sensor PCB from the scanner unit.

Caution:
Never touch the inside of the scanner unit or the mirror when disassembling or reassembling. If there is any dirt or dust on the mirror, blow it off.

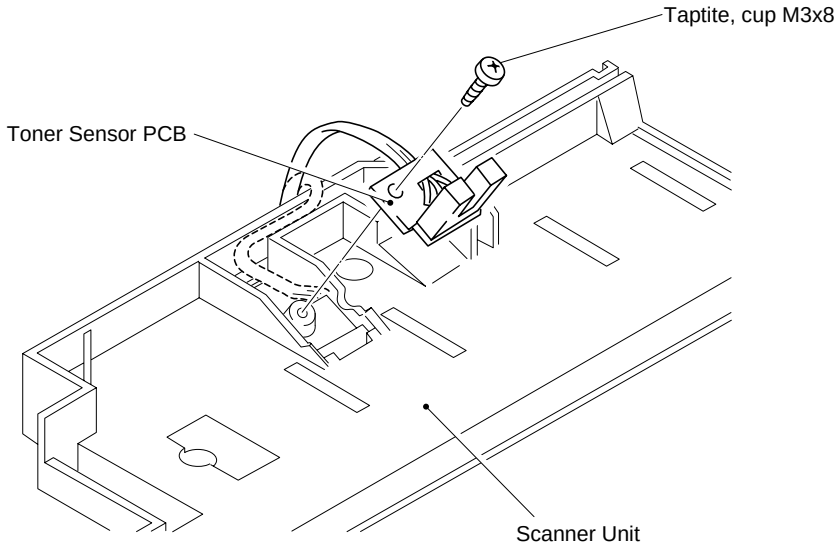


Fig. 3-14

3.8 Main PCB ASSY

(1) Remove the three M4x6 screws.

(2) Hold the hooks at the left and right of the mounting frame to pull out the main PCB ASSY.

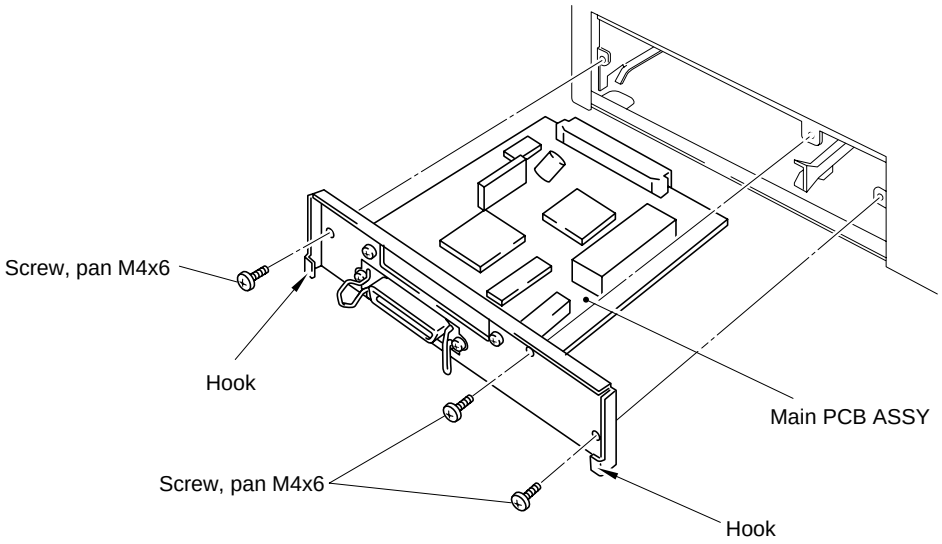


Fig. 3-15

3.9 Base Plate ASSY

> ***Caution:***
> *Prior to turning the printer upside-down, ensure that the drum unit has been removed from the printer.*

(1) Turn the printer upside down.

(2) Remove the eight M4 and five M3 self tapping screws.

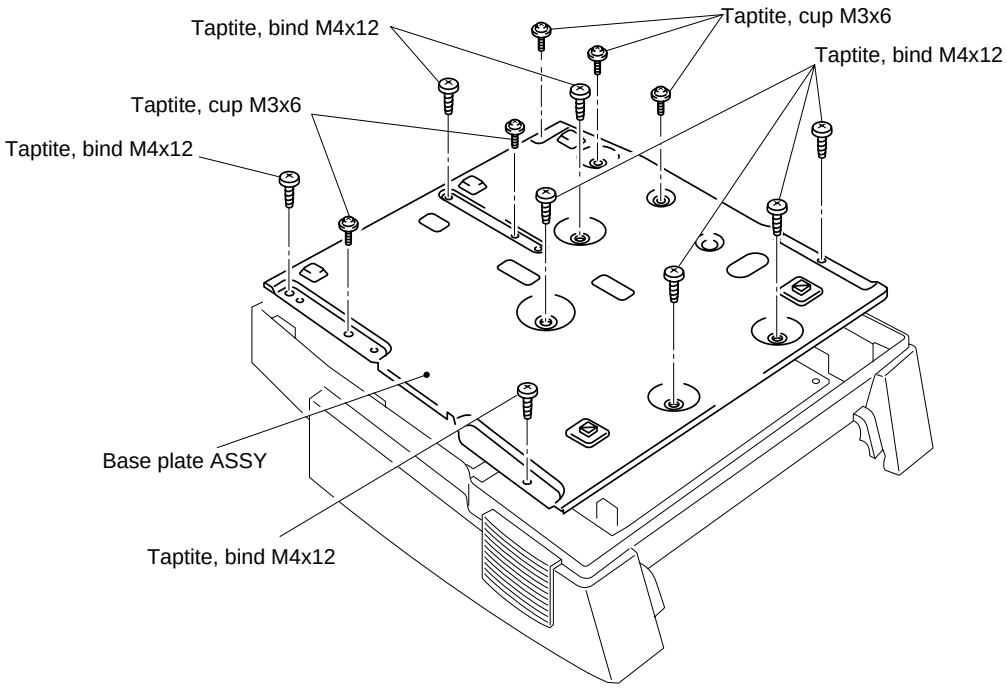


Fig. 3-16

(3) Lift the base plate ASSY and remove the grounding screw.

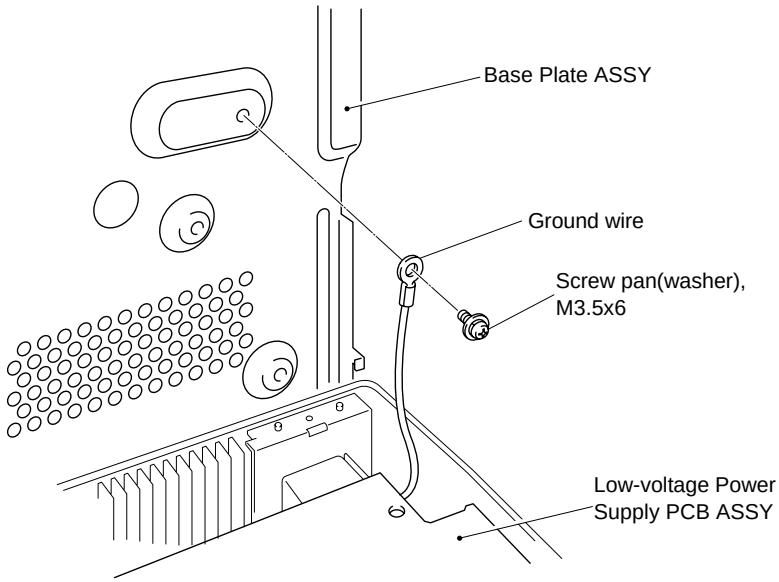


Fig. 3-17

3.10 Panel Sensor PCB ASSY

(1) Remove the main shield.

(2) Remove the M4x12 screw securing the panel sensor PCB ASSY.

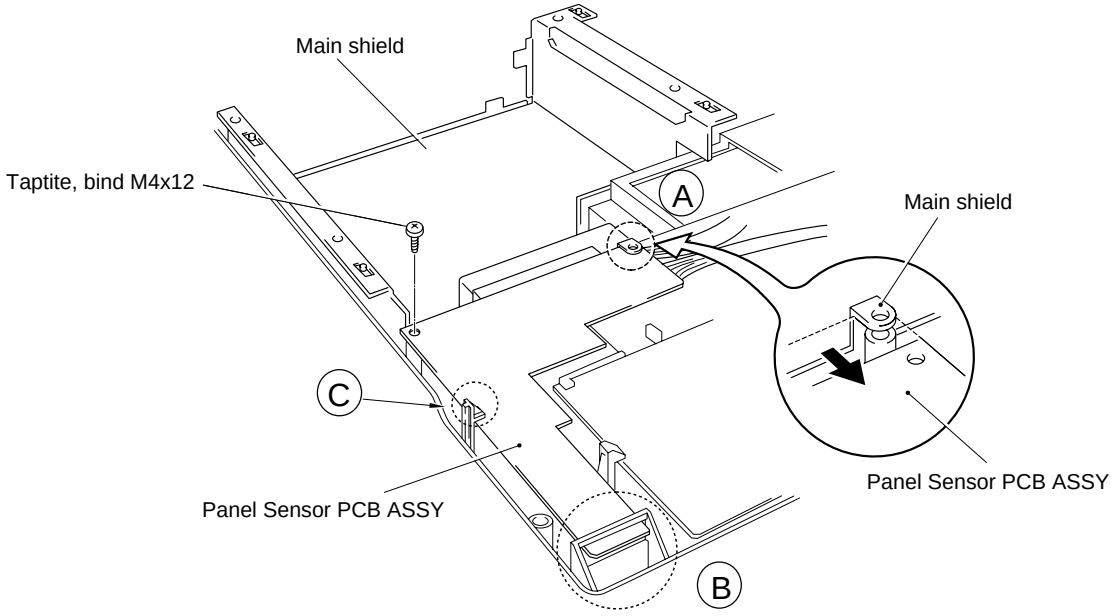
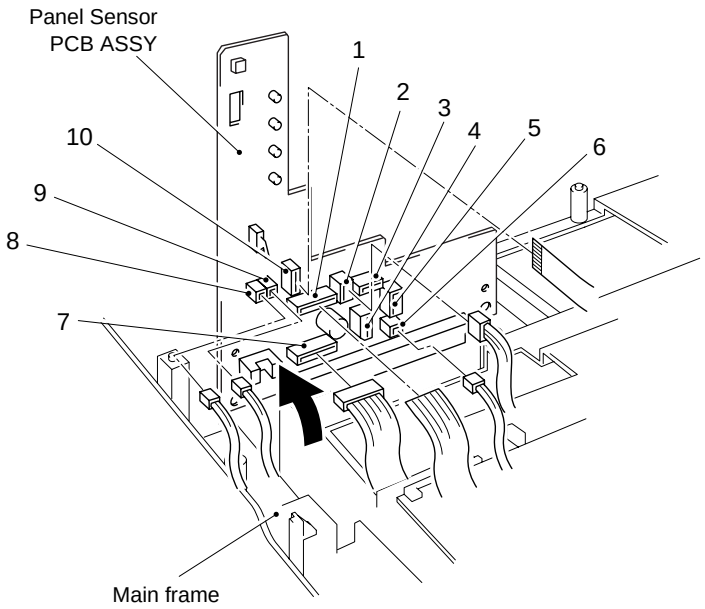


Fig. 3-18

Note:

- *When re-assembling the main shield, ensure that you fit PCB (A) to underneath the main shield.*
- *When re-assembling the panel sensor PCB, ensure that you fit the PCB into hook (B) and hook (C) first. Then, fit the two bosses to the PCB and secure the screw.*

(3) Disconnect the eight connectors from the PCB. (Three connectors have already been disconnected when removing the scanner unit.)



(Name of the Harnesses)
1. Low-voltage harness
2. Erase lamp harness
3. Toner harness
4. Scan motor flat cable
5. Laser harness
6. Solenoid harness
7. Main / sub motor connector
8. Fan motor 1 harness
9. Fan motor 2 harness
10. High-voltage flat cable

Fig. 3-19

Note:
- *When re-assembling, the cable connectors must be inserted securely into the PCB connectors and the PCB must not be stressed by the harnesses.*
- *The connectors should be inserted by matching the housing color and the number of pins.*

3.11 Low-voltage Power Supply PCB ASSY

(1) Remove the one M4x12 tapping screw securing the low-voltage power supply PCB ASSY.

(2) Disconnect the two connectors for the heater harness and the LV harness from the PCB.

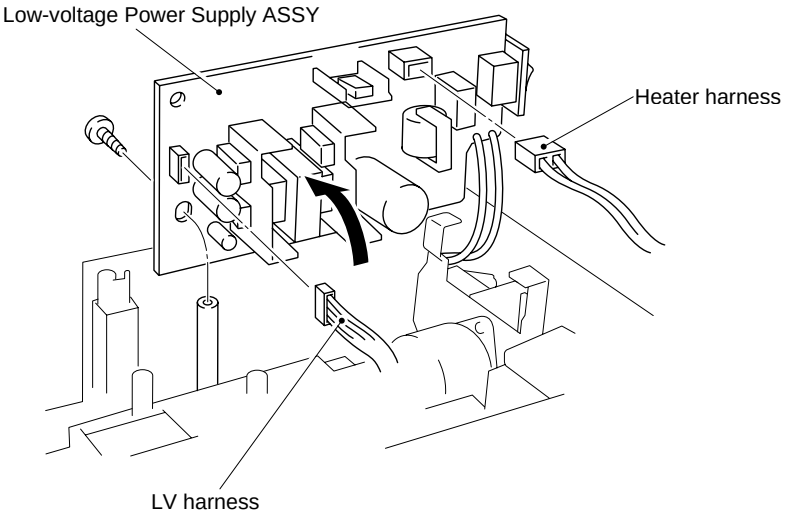


Fig. 3-20

(3) Remove the one M4x12 screw to remove the inlet holder. Then, remove the inlet and the PCB.

Note:
When re-assembling the inlet holder and AC inlet, be sure to insert the part (A) of the holder into the hole of the ferrite core.

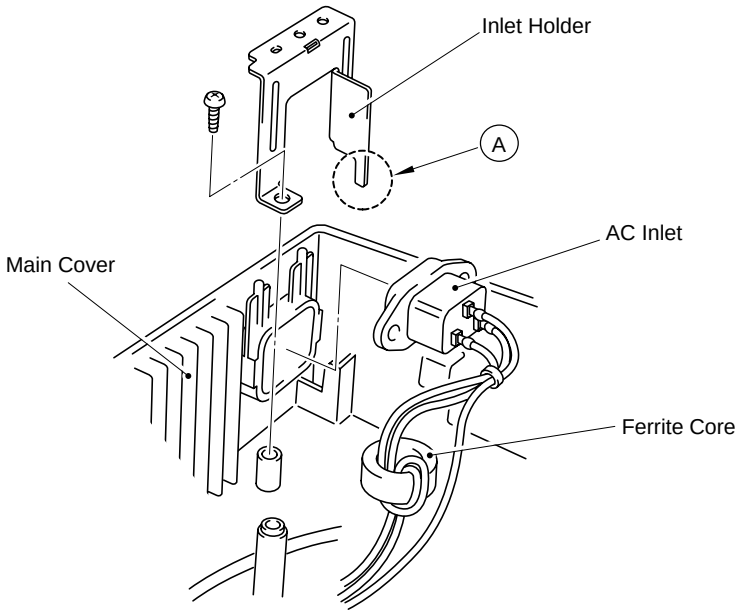


Fig. 3-21

3.12 High-voltage Power Supply PCB ASSY

(1) Remove the one M4x12 screw securing the high-voltage power supply PCB ASSY.

(2) Remove the film covering the PCB.

(2) Disconnect the HV flat cable from the PCB.

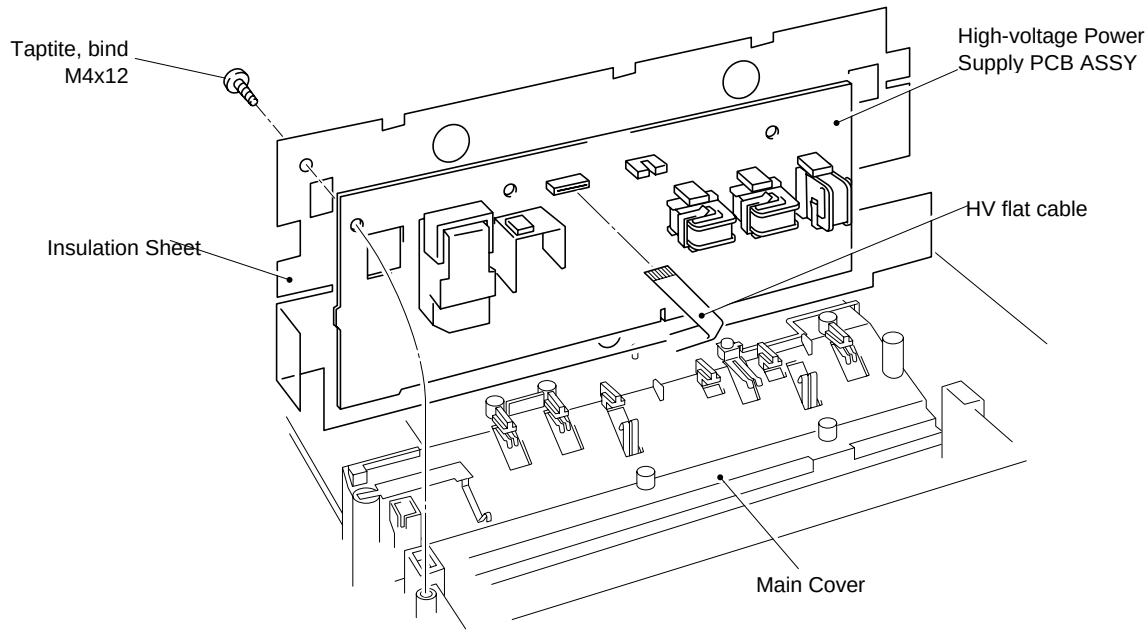


Fig. 3-22

3.13 Sub Fan Motor ASSY

(1) Slide the sub fan motor ASSY upwards.

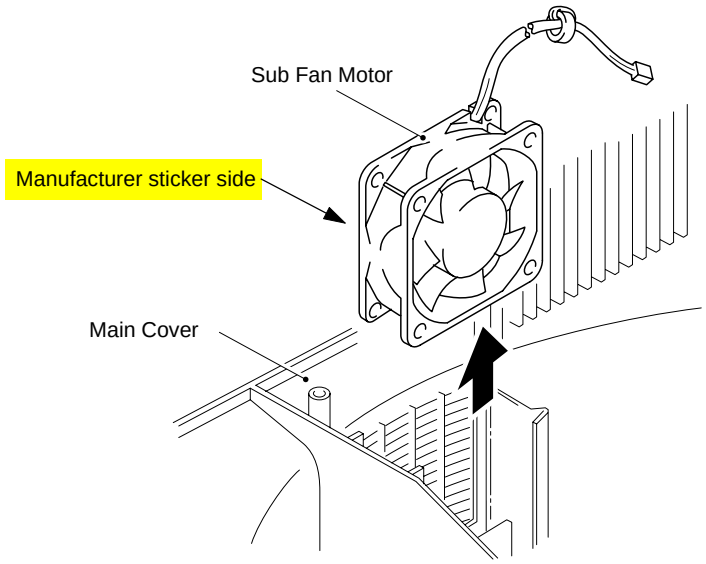


Fig. 3-23

Note:
When re-assembling the sub fan motor, ensure that the side on which the manufacturers sticker is attached is facing the main frame.

3.14 Main Fan Motor ASSY

(1) Remove the two M4x12 screws securing the fan motor holder.

(2) Remove the fan motor holder from the printer.

(3) Remove the main fan motor from the fan motor holder.

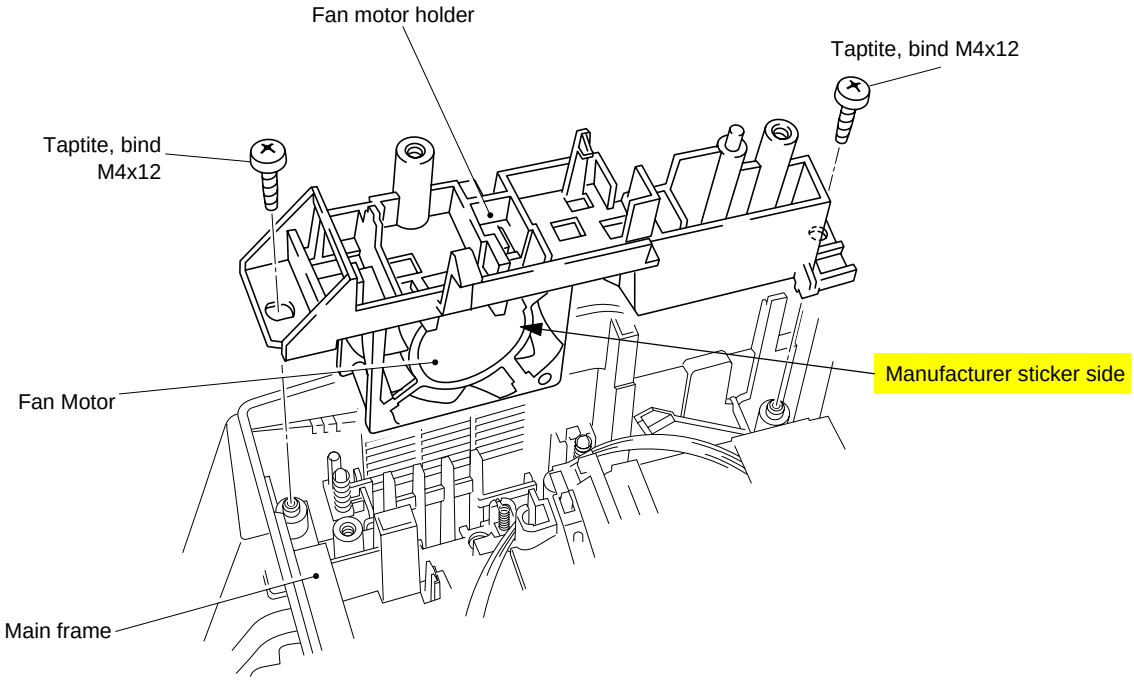


Fig. 3-24

Note:
When re-assembling the fan motor into the holder, refer to the figure on the right.

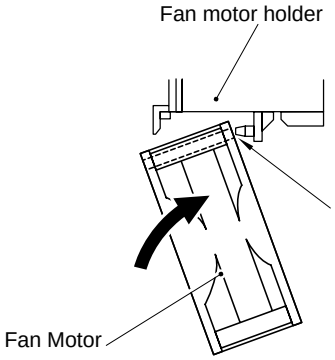


Fig. 3-25

3.15 Drive Unit

(1) Unhook the heater harness from the drive unit.

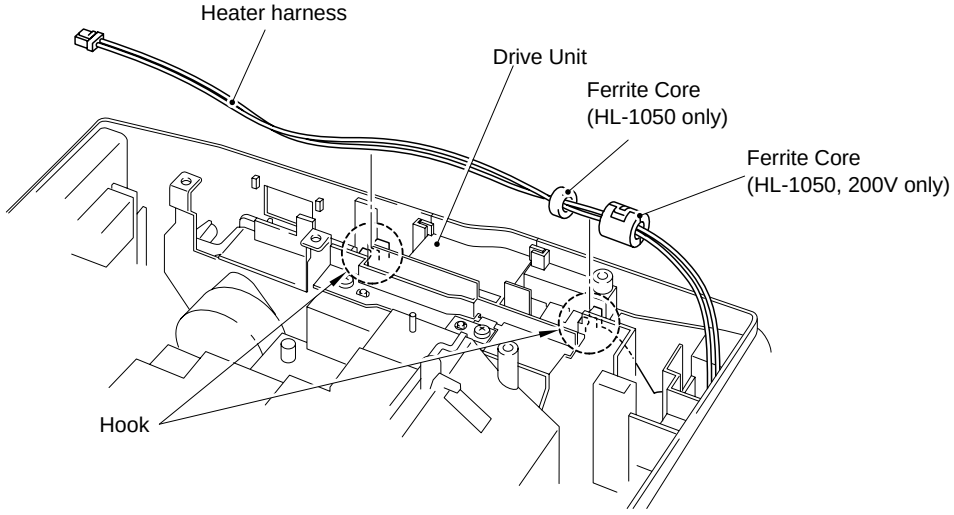


Fig. 3-26

(2) Remove the three M4x20 and one M4x12 screws securing the drive unit.

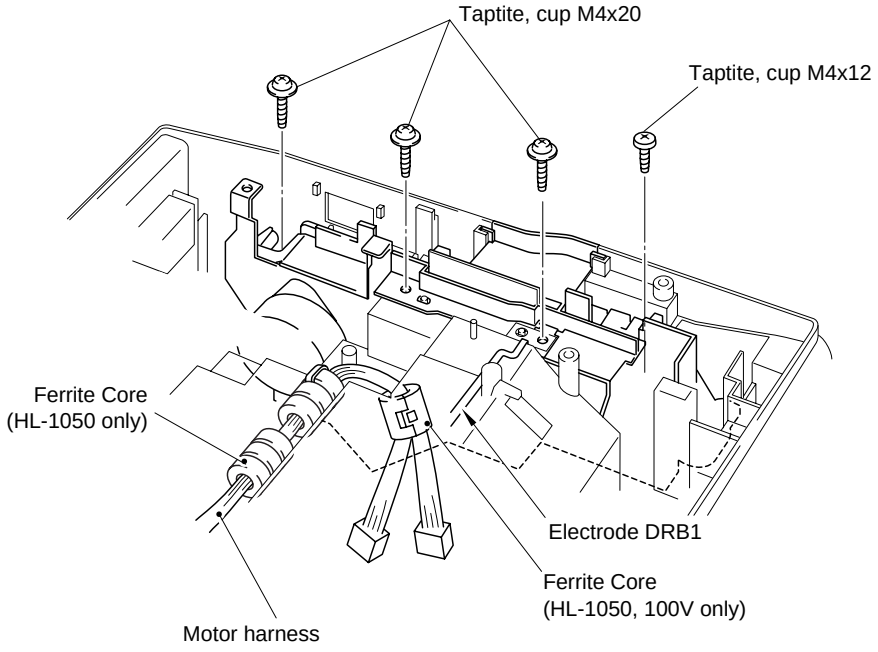


Fig. 3-27

Note:

- *When re-assembling the drive unit, ensure that you fit the drive unit underneath the electrode DRB1.*
- *When disassembling the drive unit, be sure to remove the eight ferrite cores of two types on the heater harness and the motor harness. (Refer to the figures in the previous page, Fig. 3-26 and Fig. 3-27.) The place where the bigger core should be assembled varies depending on the model.*

3.16 Main Motor ASSY

(1) Remove the two M3x6 screws securing the main motor.

(2) Remove the main motor ASSY.

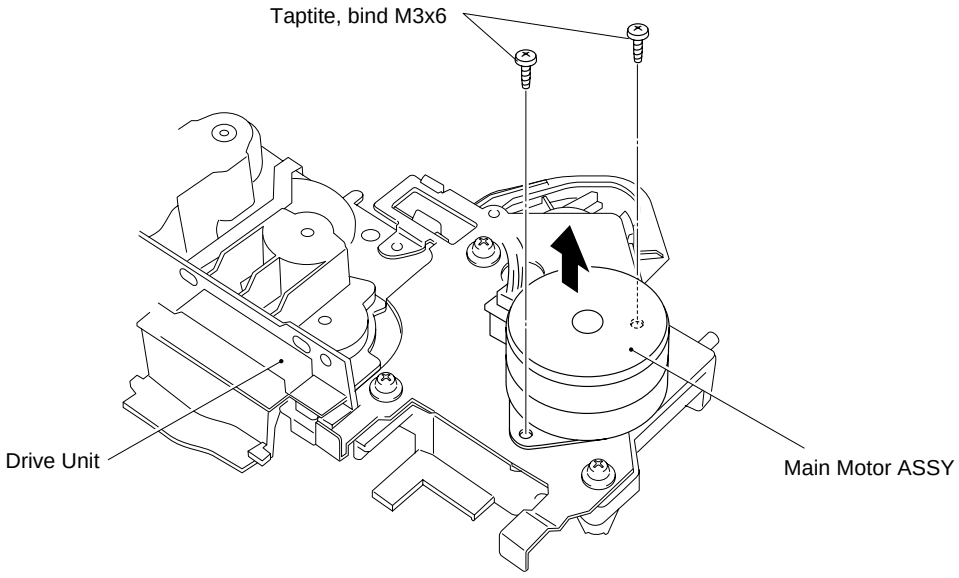


Fig. 3-28

3.17 Sub Motor ASSY

(1) Remove the two M3x6 screws securing the sub motor.

(2) Remove the sub motor ASSY.

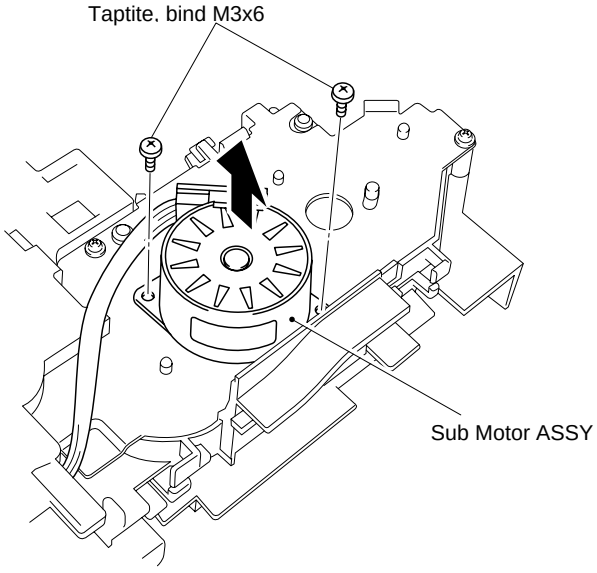


Fig. 3-29

3.18 Paper Support

(1) Pull the paper support down toward you and pull both legs outwards to release it.

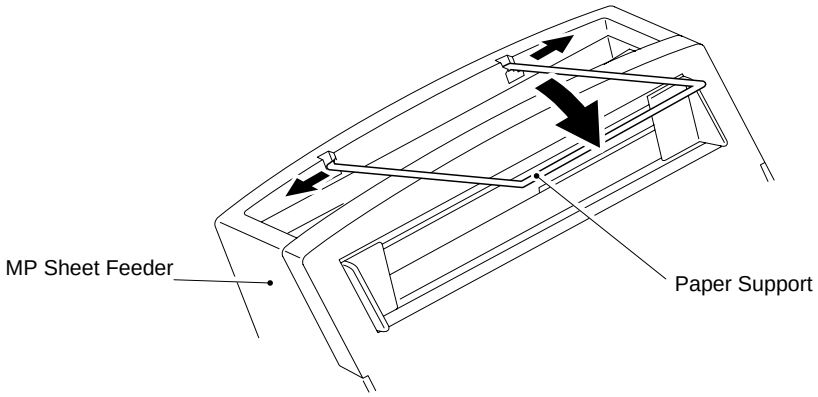


Fig. 3-30

3.19 Extension Support Wire

(1) Raise the extension support wire toward you and press both legs inward to release it.

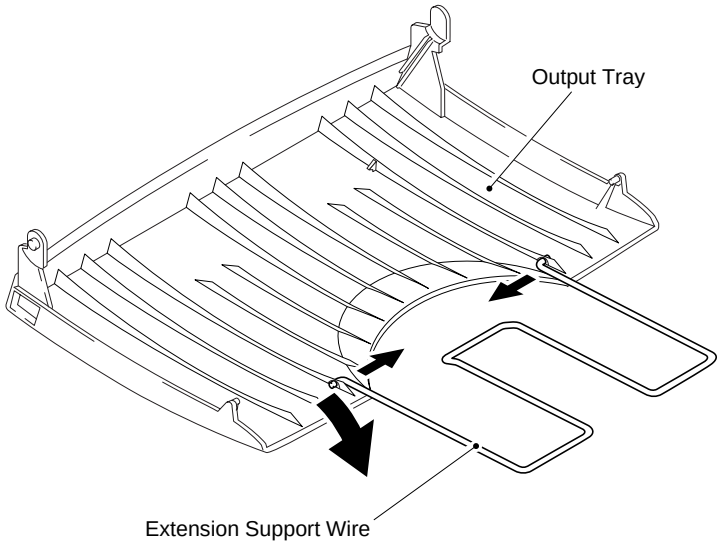


Fig. 3-31

4. PACKING

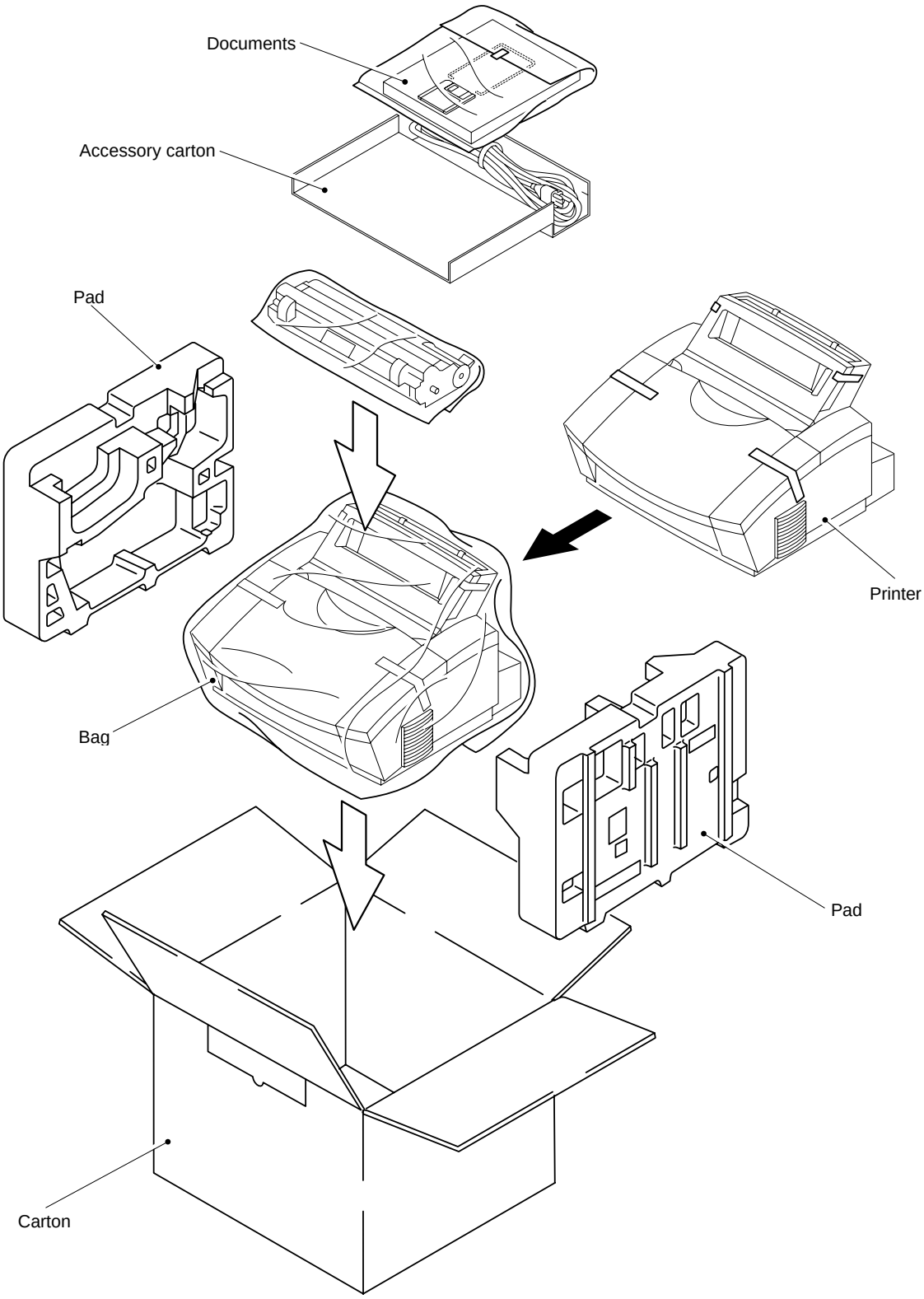


Fig. 3-32

CHAPTER IV MAINTENANCE AND TROUBLESHOOTING

1. INTRODUCTION

1.1 Initial Check

(1) Operating environment

Check if :

- The source voltage stays within ±10% from the rated voltage shown on the rating plate.
- The printer is installed on a solid, level surface.
- The room temperature is maintained between 10°C and 32.5°C. The relative humidity is maintained between 20% and 80%.
- The printer is not located in a dusty place.
- The printer is not exposed to ammonia fumes or other harmful gases.
- The printer is not located in a hot or humid area (such as near water or a humidifier).
- The printer is not exposed to direct sunlight.
- The room is well-ventilated.
- The printer is not placed where the ventilation hole of the printer is blocked.

(2) Print paper

Check if :

- A recommended type of print paper is being used. [If the paper is too thick or too thin, or tends to curl, paper jams or paper feed problems may occur, or printed images may be blurred.]
- The print paper is damped. [If so, use fresh paper, and check whether the print quality improves or not.]
- The print paper is short-grained paper or acid paper. [If so, print quality problems may occur. For further information, refer to paper specifications in Chapter II.]

(3) Consumables

Check if :

- The Toner lamp is not lit on the control panel when a toner cartridge is installed in the printer. [If the lamp is lit, replace the cartridge with a new one. If blank spots occur on printouts, take out the drum unit and slowly rock it to redistribute the toner evenly.]

(4) Others

Condensation:

When the printer is moved from a cold room into a warm room in cold weather, condensation may occur inside the printer, causing various problems as listed below:

- Condensation on the optical surfaces such as the scanning mirror, lenses, the reflection mirror and the protection glass may cause the print image to be light.
- If the photosensitive drum is cold, the electrical resistance of the photosensitive layer is increased, making it impossible to obtain the correct contrast when printing.

- Condensation on the corona unit may cause corona charge leakage.
- Condensation on the hopper gate and separation pad may cause paper feed troubles.

If condensation has occurred, wipe the effected units or parts with a dry cloth.

If the drum unit is unpacked soon after it is moved from a cold room to a warm room, condensation may occur inside the unit, which may cause incorrect images. Instruct the user to allow the unit to come to room temperature before unpacking it. This will take one or two hours.

1.2 Basic Procedure

If a malfunction or incorrect print appears, make an initial check following the basic procedure below:

(1) Check the error lamps following the inspection procedure described later in this section. If no error lamps are lit, see Section 4 for troubleshooting information.

(2) If any defective image output is found, follow the image defect fault descriptions in this section.

2. CONSUMABLE PARTS

2.1 Drum Unit

The Drum lamp is on when the drum unit is nearly at the end of its life.

Life expectancy: 20,000 pages at 20 pages per job
8,000 pages at 1 page per job

Note:
There are many factors that determine the actual drum life, such as temperature, humidity, type of paper and toner that you use, the number of pages per print job, etc..

2.2 Toner Cartridge

Toner low: The Data and Alarm lamps blink once every five seconds.

Toner empty: The Data and Alarm lamps blink once every second.

Life expectancy: 2,400 pages/new toner cartridge
(when printing A4- or letter-size paper at 5% print coverage)

Note:
Toner life expectancy will vary depending on the type of average print job printed.

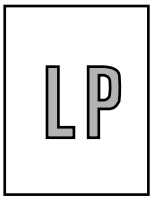
2.3 Periodical Replacement Parts

No.	Description	Part No.	Qty	service life (number of prints)	Remarks
1	Fixing Unit	UL8750001	1	(50,000)	120V
	Fixing Unit	UL8751001	1	(50,000)	230V
2	Scanner Unit	UL8748001	1	(50,000 or more)	
3	MP sheet feeder ASSY	UL8749001	1	(50,000 or more)	

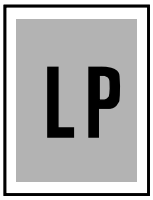
Note:
The above table shows only estimated values. They are subject to change without prior notice.

3. IMAGE DEFECTS

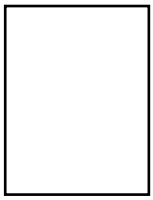
3.1 Image Defect Examples



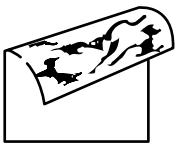
I-1 Light

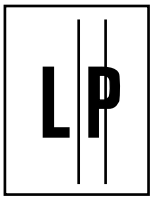


I-2 Dark


I-3 Completely blank

I-4 All black

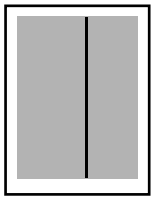

I-5 Dirt on back of paper

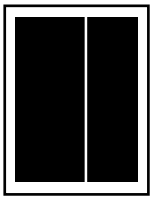


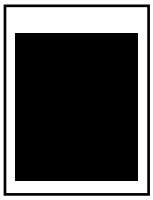
I-6 Black vertical streaks

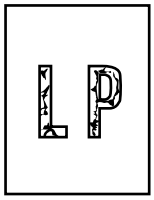
I-6 Black vertical streaks

I-7 Black horizontal stripes

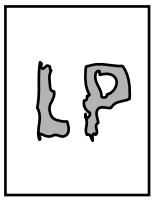

I-8 Black vertical streaks


I-9 White vertical streaks

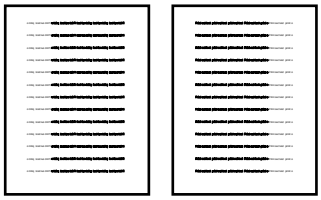

I-10 Faulty registration

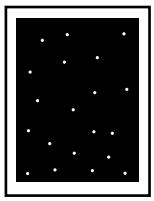


I-11 Poor fixing

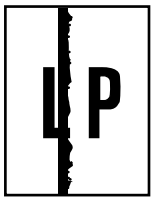


I-12 Image distortion


I-13 Faint print


I-14 White spots

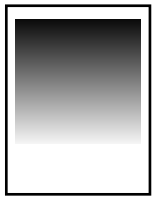
I-15 Black spots

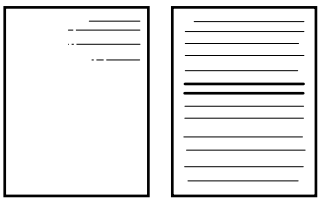


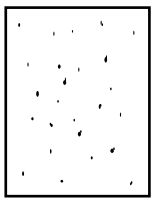
I-16 Black band

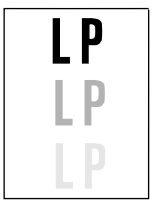
I-17 Gray background

I-18 Hollow print


I-19 Downward fogging of solid black


I-20 Horizontal lines


I-21 Light rain



I-22 Ghost

Fig. 4.1

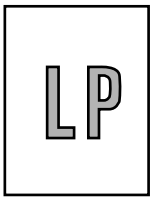
3.2 Troubleshooting Image Defects

The following procedures should be followed in the event of specific image defects.

See subsection 3.3 for information about the location of the high-voltage contacts and grounding contacts.

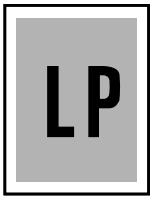
> ***Caution:***
> *Print quality can not be guaranteed in the following cases;*
> - *When using the printer for a special job, such as printing of name cards.*
> - *When printing much narrower paper than printable paper width.*
> - *When printing on one area of the paper continuously even though Letter or A4-size paper is used.*

I-1	Light



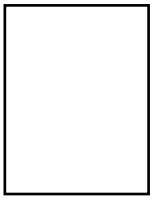
Possible cause	Step	Check	Result	Remedy	HV.GND contacts (Fig.4-5)
Toner sensing failure (printer side)	1	Can printing be started with the drum unit removed?	Yes	Toner sensor failure. Check if the toner sensor needs cleaning and check the toner sensor connection.	
Toner sensing failure (toner cartridge side)	2	Is the problem solved when 4 or 5 pages are printed after the toner cartridge is replaced with a full one?	Yes	The wiper of the toner cartridge is defective. Replace the toner cartridge.	
Drum connection failure	3	Are all the contacts (HV, GND) connected when the drum unit is installed?	No	Clean contact electrodes both in the printer body and on the drum unit.	①
High-voltage power supply PCB failure	4	Check the harness connection between the high-voltage power supply PCB and the panel sensor PCB.	No	If the connection is normal, replace the high-voltage power supply PCB.	
Panel sensor PCB or main PCB failure	5	Perform the same check as step 4 above and also between the panel sensor PCB and the main PCB.	No	Replace the panel sensor PCB or the main PCB.	
Scanner unit failure	6	Is the problem solved by replacing the scanner unit?	Yes	Replace the scanner unit.	

I-2	Dark



Possible cause	Step	Check	Result	Remedy	HV.GND contacts (Fig.4-5)
Corona failure (soiled wire)	1	Is the corona wire dirty?	Yes	Clean the corona wire by using the wire cleaner.	⑧
Corona failure (contact failure)	2	Are the corona electrodes between the printer body and drum unit dirty?	No	Clean both electrodes.	⑥
Drum unit failure	3	Is the problem solved when the drum unit is replaced?	Yes	Replace the drum unit with a new one.	
High-voltage power supply PCB	4	Are there any disconnected connectors?	No	Replace the high-voltage power supply PCB.	
Main PCB	5	Are there any disconnected connectors?	No	Replace the main PCB.	
Panel sensor PCB	6	Are there any disconnected connectors?	No	Replace the panel sensor PCB.	

I-3	Completely blank

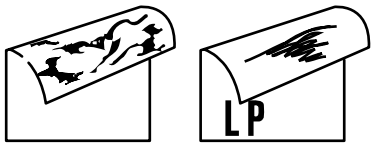


Possible cause	Step	Check	Result	Remedy	HV.GND contacts (Fig.4-5)
Developing bias contact failure	1	Are the developing bias contacts between the printer body and drum unit dirty?	Yes	Clean the electrodes at both sides.	⑦
Drum unit	2	Are the drum shaft and drum electrode of the printer body connected correctly?	Yes	Clean the shaft and the electrode.	①
			No	Check the connection between the shaft and the electrode.	①
Drum unit failure	3	Is the problem solved after the drum unit is replaced?	Yes	Replace the drum unit.	
Scanner harness connection failure	4	Is the scanner harness connected securely? Is there any play in the connection?	No	Reconnect the connector properly.	
Main / Panel sensor PCB connection failure	5	Are printing signals being input to the scanner? Is the problem solved after the main PCB or the panel sensor PCB replaced?	Yes	Replace the main PCB or the panel sensor PCB.	
Scanner unit failure	6	Scanner interlock lever damaged.	Yes	Replace the scanner unit.	
		Scanner mirror is broken or loose.	No	Replace the high-voltage power supply PCB.	

I-4	All black

Possible cause	Step	Check	Result	Remedy	HV.GND contacts (Fig.4-5)
Corona failure	1	Is the corona wire of the drum unit broken?	Yes	Replace the drum unit.	
	2	Are the electric terminal springs in the printer body and the electrode on the bottom face of the drum unit dirty?	Yes	Clean the terminals in the printer and on the drum.	⑥
Harness connection	3	Is the scanner unit connected with the panel sensor PCB correctly?	No	Check the harness connection between the scanner unit and the panel sensor PCB.	
High-voltage power supply PCB	4	Is the problem solved after high-voltage power supply PCB replaced?	Yes	Replace the high-voltage power supply PCB.	
Ditto	5	Perform the same check as in step 3.	Yes	Replace the panel sensor PCB.	
Main PCB	6	Is the problem solved after main PCB is replaced?	Yes	Replace the main PCB.	
Panel sensor PCB	7	Is the problem solved after the panel sensor PCB is replaced?	Yes	Replace the panel sensor PCB.	

I-5	Dirt on the back of paper

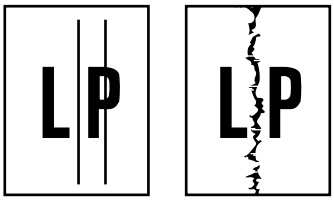


Possible cause	Step	Check	Result	Remedy
Fixing unit	1	Is the pressure roller dirty? Is any other area in the printer dirty?	Yes	Clean the pressure roller. (See the following note.)
Dirt in the drum unit	2	Is the transfer roller dirty? Is the problem solved after the drum unit is replaced?	Yes	Replace the drum unit
			No	Replace the high-voltage power supply PCB.

Note: Clean the pressure roller as follows;

(1) Set three or more sheets of paper in the MP sheet feeder.
(2) Open the top cover.
(3) Turn on the power switch while holding down the switch on the control panel.
(4) Release the panel switch when the Drum lamp is on.
(5) Close the top cover.
(6) Hold down the panel switch until the Ready lamp is on, then release the switch.
(7) Print three patterns; grid, zip and solid black.
(8) Turn off the power switch with the top cover closed.
(9) Set paper in the manual slot with the solid black side up.
(10) Turn on the power switch while holding down the switch on the control panel.
(11) Release the panel switch when the Drum lamp is on.
(12) Press the panel switch again and release it immediately.
(13) Print a page of test pattern while cleaning the pressure roller.

I-6	Black and blurred vertical streaks



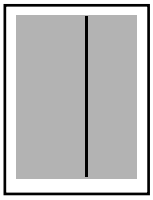
Possible cause	Step	Check	Result	Remedy	HV.GND contacts (Fig.4-5)
Corona failure	1	Is the corona wire dirty?	Yes	Clean the corona wire with the wire cleaner.	⑧
Corona failure	2	Is the vertical block streak about 10mm wide? Is the corona wire cleaner not in its home position?	Yes	Return the wire cleaner to its home position.	
Dirt in the paper feed system	3	Is the paper tray or feed system on the drum unit soiled with toner?	Yes	Clean the toner off.	
Scratch on the drum	4	Is the drum surface scratched?	Yes	Replace the drum unit.	
Cleaning failure	5	Is the drum surface dirty with toner in streaks?	Yes	Replace the drum unit.	
Scratch on the heat roller	6	Is the surface of the heat roller scratched?	Yes	Replace the fixing unit.	

Note:
If you print the same pattern continuously, the drum will be worn and black vertical streaks will appear on the paper.

I-7	Black and blurred horizontal stripes

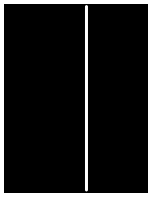
Possible cause	Step	Check	Result	Remedy
Scratch on the drum	1	Are the horizontal stripes at 94mm (OPC drum) intervals?	Yes	Replace the drum unit.
Toner stuck on the developer roller	2	Are the horizontal stripes at 25mm (developer roller) intervals?	Yes	Print several sheet and see what happens. The problem will disappear after a while. If not, replace the drum unit.
Scratch on the fixing roller	3	Are the horizontal streaks at 63mm (heat roller) intervals?	Yes	Replace the fixing unit.
High-voltage power supply PCB	4	Is the problem solved after the high-voltage power supply PCB is replaced?	Yes	Replace the high-voltage power supply PCB.

I-8	Black vertical streaks (in a gray background)



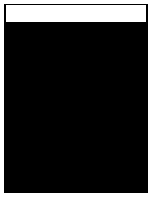
Possible cause	Step	Check	Result	Remedy
Translucent stain on the scanner window	1	Are there any stains on the scanner window?	Yes	Clean the scanner window. If it is not effective, replace the scanner unit.

I-9	White vertical streaks



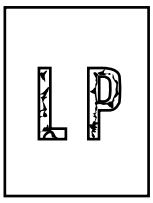
Possible cause	Step	Check	Result	Remedy
Scanner window dirty	1	Is the scanner window dirty?	Yes	Clean the scanner window with a dry tissue.
Transfer failure	2	Is the transfer roller scratched?	Yes	Replace the drum unit.

I-10	Faulty registration



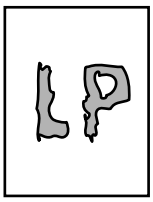
Possible cause	Step	Check	Result	Remedy
Excessive paper load	1	Is the paper loaded in the paper feeder more than 22mm deep?	Yes	Instruct the user to keep paper loads below 22mm in depth.
Print paper	2	Is the specified weight of the recommended paper being used?	No	Instruct the user to use the recommended types of paper.
Ditto	3	Is the first printing position within ±1mm of the tolerance specification?	Yes	Adjust the Y offset by using the utility software supplied.
Paper resist sensor position incorrect	4	Is the position of the paper resist sensor normal?	No	Reposition the sensor to the correct position.

I-11	Poor fixing



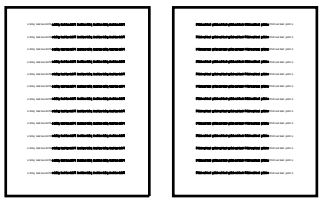
Possible cause	Step	Check	Result	Remedy
Printing paper	1	Is thick paper more than 42lb weight in use?	Yes	Instruct the user to use paper of the recommended weight and thickness.
Toner sensing failure	2	Is the problem solved by replacing the drum unit or the toner cartridge? (When printing is faint.)	Yes	Toner is empty. The toner sensing is defective, clean the toner sensor. If the wiper in the toner cartridge is broken, replace the toner cartridge with a new one.
Thermistor failure	3	Is the thermistor fitted correctly?	No	Fit the thermistor correctly.
Low-voltage power supply PCB failure	4	Is the problem solved by replacing the low-voltage power supply PCB?	Yes	Replace the low-voltage power supply PCB.

I-12	Image distortion



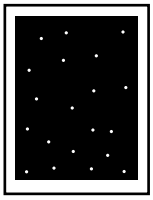
Possible cause	Step	Check	Result	Remedy
Scanner	1	Is the scanner unit secured to the frame incorrectly? Is there any play?	Yes	Secure the unit correctly and tighten the screws.
Scanner LD emission failure Scanner motor rotation failure	2	Is the laser diode or the laser scanner motor defective?	Yes	Replace the scanner unit.
Scanner connection failure	3	Is the scanner harness connected properly? Is it coming loose?	Yes	Connect the harness correctly.

I-13	Faint print



Possible cause	Step	Check	Result	Remedy
Printer not level	1	Is the printer placed horizontally?	No	Place the printer on a flat surface.
Drum unit	2	Does the problem happened immediately after replacing the drum unit with a new one?	Yes	Remove and carefully shake the drum unit horizontally.
Scanner window dirty	3	Is the window of the laser scanner dirty?	Yes	Clean the scanner window with a dry tissue.
Scanner unit failure	4	Is the problem solved by replacing the scanner unit?	Yes	Replace the scanner unit.

I-14	White spots



Possible cause	Step	Check	Result	Remedy
Toner cartridge	1	Is the toner in the toner cartridge almost empty?	Yes	Shake the drum unit horizontally. Replace the toner cartridge with a new one.
			No	Replace the drum unit.
Print paper	2	Is the problem solved after change to specified freshly unpacked paper?	Yes	Recommend the user to change the paper. (Damp (wet) paper might be used.)
Environment	3	Check if the problem still appears after the printer has warmed up.	Yes	Replace the drum unit. Advise the user of the specified print environment.

I-15	Black spots

Possible cause	Step	Check	Result	Remedy
Drum unit	1	Are the spots at 94mm intervals? The problem is not solved after printing a few pages.	Yes	If toner remains stuck, wipe it off gently with a cotton swab. Replace the drum unit if the OPC drum is scratched or deteriorated (exposed). (Refer to the following note.)
Fixing unit	2	Are the spots at 63mm intervals? The problem is not solved after printing a few pages.	Yes	Check and clean the heat roller with a cloth dampened with alcohol. Replace the fixing unit.
High-voltage power supply PCB	3	Is the problem solved after the high-voltage power supply PCB is replaced?	Yes	Replace the high-voltage power supply PCB.

Note: Clean the drum unit as follows:

(1) Place the printing samples in front of the process unit, and find the exact position of the image defect.

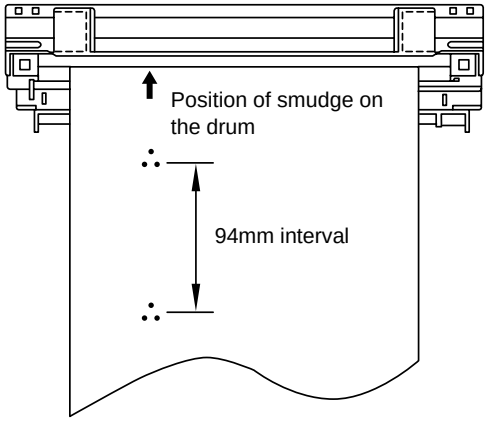


Fig. 4-2

(2) Turn the drum gear by hand while looking at the surface of the OPC drum.

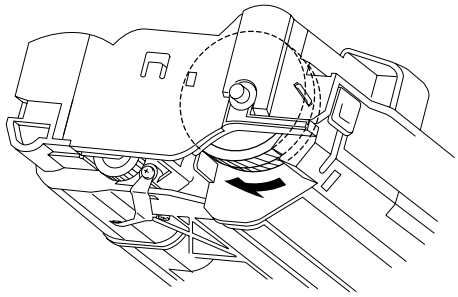


Fig. 4-3

(3) Wipe the surface of the photosensitive drum with a cotton swab until the dust or paper powder on the surface comes off.

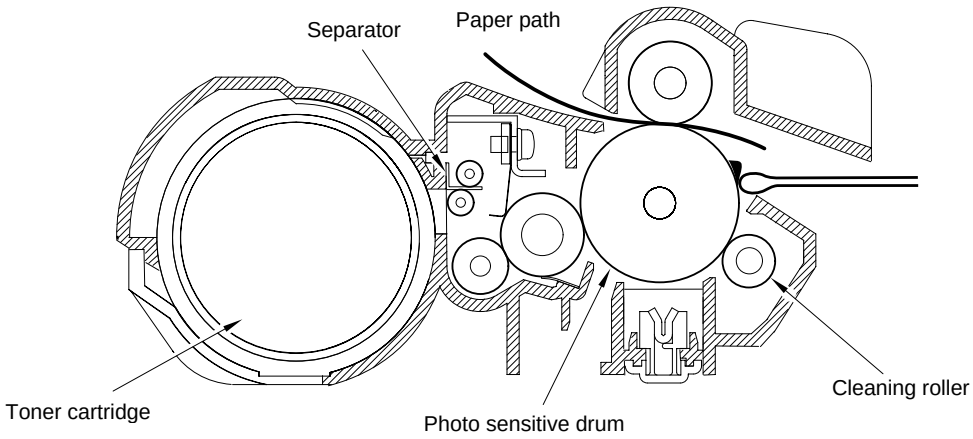
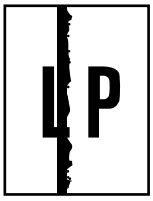


Fig. 4-4

Caution:

- *Do not wipe the surface of the photosensitive drum with something sharp. (ball-point pen etc.)*
- *Use the cleaning liquid which is a 50-50 mixture of ethyl alcohol and pure water.*

I-16	Black band



Possible cause	Step	Check	Result	Remedy
Drum unit	1	Is the wire cleaner positioned at its home position?	No	Return the wire cleaner to its home position.
Ditto	2	Is the corona wire dirty?	Yes	Clean the corona wire. If the problem still appears after cleaning, replace the drum unit.

I-17	Gray background

Note:
This problem may appear on the first 10 to 20 pages immediately after replacing the toner cartridge.

Possible cause	Step	Check	Result	Remedy
Print paper	1	Does the paper being used meet the paper specification (weight, etc.).	No	Recommend to change the paper to a specified type of the paper.
			Yes	Recommend to change the paper to a fresh pack paper.
Drum unit	2	Is the problem solved after replacing the drum unit?	Yes	Replace the drum unit.
			No	Replace the high-voltage power supply PCB.

Note: The following cases increase the possibility of this problem.

1) The drum unit is at the end of its life.
2) There is dust or paper powder.
3) A large amount of paper whose width is narrower than A4 is printed.
4) Acid paper is being used.

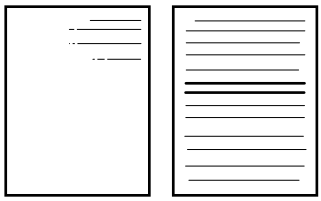
I-18	Hollow print

Possible cause	Step	Check	Result	Remedy
Print paper	1	Is thick paper of more than 42lb being used or extremely rough surface paper?	Yes	Recommend to use the specified type of paper.
			No	Refer and compare with I-14.

I-19	Downward fogging of solid black

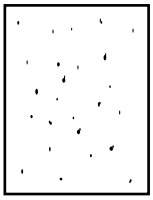
Possible cause	Step	Check	Result	Remedy
Drum unit	1	Is the problem solved after replacing the drum unit?	Yes	Replace the drum unit.
High-voltage power supply PCB	2	Is the problem solved after replacing the high-voltage power supply PCB?	Yes	Replace the high-voltage power supply PCB.

I-20	Horizontal lines



Possible cause	Step	Check	Result	Remedy	HV.GND contacts (Fig.4-5,4-7)
SR electrode	1	Are the SR electrodes between the printer body and the drum unit dirty?	Yes	Clean both electrodes.	⑨
SR connection failure	2	Are the SR electrodes between the printer body and the drum unit connected correctly?	No	Check the SR connection.	
Feed roller	3	Are the feed roller shaft and the ground contact connected correctly?	No	Check the connection between the shaft and the ground contact.	⑩

I-21	Light rain

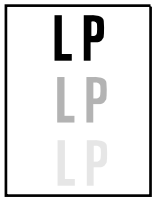


Possible cause	Step	Check	Result	Remedy
Drum unit failure	1	Is the problem solved after replacing the drum unit with one that does not contain a starter sheet**?	Yes	Replace the drum unit.
High-voltage power supply PCB failure	2	Is the problem solved after replacing the high-voltage power supply PCB?	Yes	Replace the high-voltage power supply PCB.

***Note:*

Make sure to use a used drum unit which has already ejected the starter sheet. It is not possible to find the drum unit failure if you use a new drum unit with a starter sheet in it.

I-22	Ghost



Possible cause	Step	Check	Result	Remedy
Driver setting	1	Is thin paper such as 64g/m^2 used under the thick paper mode?	Yes	Change the current mode to the normal mode from the driver setting. Print 5 or 6 blank pages if this problem occurs.

3.3 Location of High-voltage Contacts and Grounding Contacts

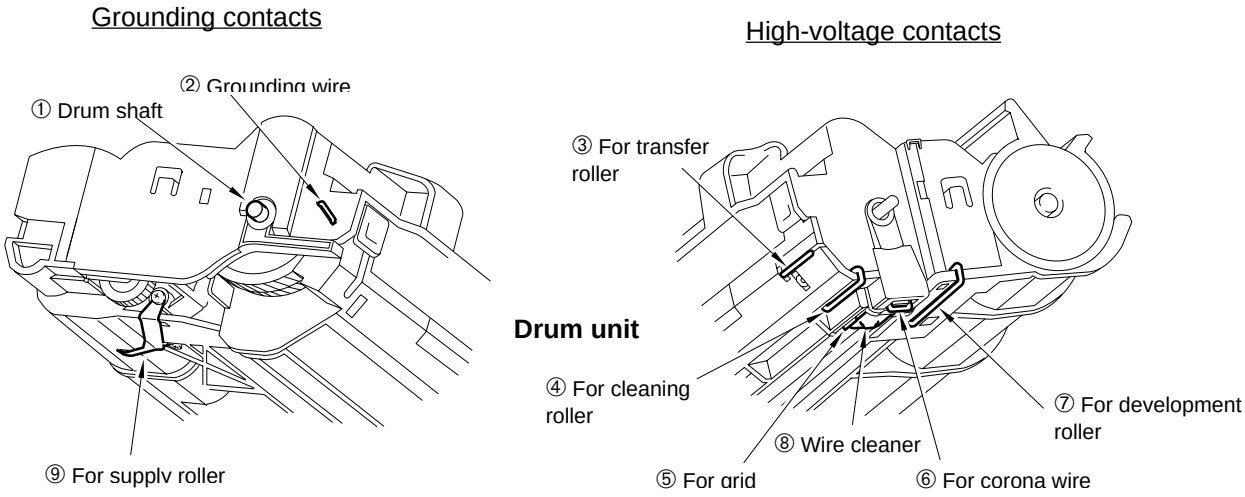


Fig. 4-5

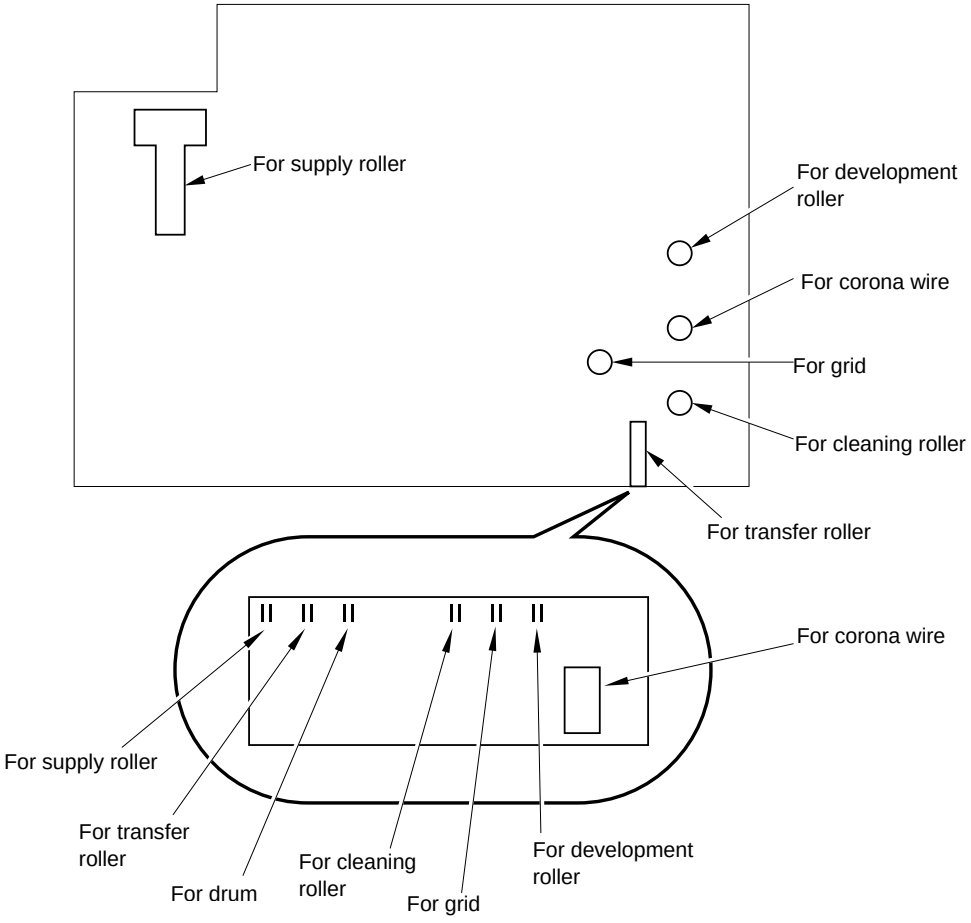


Fig. 4-6

3.4 Location of Feed Roller Shaft and Grounding Contacts

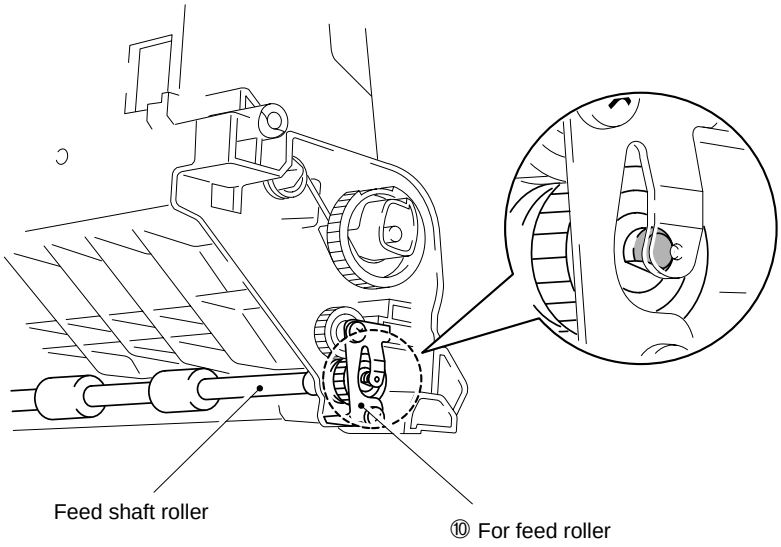


Fig. 4-7

4. PAPER JAM

Problem	Type of jam	Cause	Temp measure
Jam at power on	Paper stuck	Paper feed sensor or paper eject sensor is turned on.	Remove the paper inside the printer. If there is no paper, check the suspect sensors referring to note and clear the problem.
Top of paper stopped at 20mm from the fixing unit. Paper feed roller rotated twice.	No paper	Paper feed sensor is not turned on.	Check paper feed sensor motion referring to note and clear the problem.
Top of paper stopped at 250mm from the fixing unit. Next paper is not fed.	Jam caused by paper length detected as longer than 400mm (16 inches).	Paper feed sensor is not returning properly, and is not turned off.	Check paper feed sensor motion referring to note and clear the problem.
Top paper stopped between the paper feed roller and the pick-up roller.	Jam caused by paper length detected as shorter than 80mm.	Paper feed sensor was turned off early. Malfunction of actuator or hardware noise.	Check sensors referring to note and clear the cause of the problem.
Paper was fed approx. 20mm from the pick-up roller.	Jam caused by a paper feed delay.	Due to paper dust or rubber of the pick-up roller wear, paper was not fed in at the proper timing.	Remove the paper dust attached to the pick-up roller. If the rubber is worn out, replace it with new one.
Top of paper stopped at 17mm from the contact point of the heat roller and pressure roller.	Jam caused by the paper sensed as not being ejected from the paper eject sensor.	Paper eject sensor does not work properly and is not turned off. (single printing)	Check the sensor motion referring to note and clear the problem.
Jam occurred after ejecting paper.	Same as above.	Same as above. (continuous printing)	Same as above.
Top of paper stopped at 20mm from the fixing unit.	1. Cover open 2. Bug	1. Cover is not closed properly. 2. Bug	1. Check if the drum unit is installed correctly. 2. Please inform BIL.

Note: How to check the sensors

(1) Open the cover.

(2) Power on the printer while pressing the panel switch.

(3) Release the panel switch.

(4) Press and release the panel switch.

Results:

**Alarm Lamp is ON = Paper feed sensor is turned ON*

**Drum Lamp is ON = Paper eject sensor is turned ON*

5. TROUBLESHOOTING MALFUNCTIONS

When carrying out countermeasures for malfunctions as described in this section, check connectors for contact failure before measuring the voltage at the specified connector pins.

M-1	No AC power supplied

Possible cause	Step	Check	Result	Remedy
Supply voltage	1	Is the correct voltage present at the outlet?	No	Inform the user that the correct voltage is not supplied at the outlet.
Power plug	2	Is the power cord securely plugged into the outlet?	No	Plug the power cord securely into the outlet.
Fuse (F1, F2)	3	Is the fuse blown?	Yes	If the fuse blows again immediately after replacing the low-voltage power supply PCB, check that there is not a short circuit somewhere in the AC power supply line.
Wiring	4	Unplug the power supply plug. Is there a broken wire between the AC input connector of the low-voltage power supply and the power plug?	Yes	Replace the AC power cord.

M-2	No DC power supplied

Possible cause	Step	Check	Result	Remedy
AC power supply	1	Is AC power supplied between connectors CN1-L and CN1-N when the power plug is plugged into the outlet?	No	Follow the same check procedure of M-1 “No AC power supplied”.
Wiring, DC load	2	Turn the power switch OFF and disconnect the P13 connector (panel sensor PCB). Turn the power switch ON again. Measure the voltages between the terminals. Do the measured voltage satisfy the prescribed value in the table below?	Yes	Turn the power switch OFF, reconnect the connector and turn the power switch ON again. If the protector circuit is activated, check the connector, the wiring from the connector, and the DC load.
Low-voltage power supply PCB			No	Replace the low-voltage power supply PCB.

PCB	+ lead pin	- lead pin	Voltage
Panel Sensor	P8-1	P8-4	Approx. 24V
	P8-2	P8-3	Approx. 5V

***Caution**:*

If you analyze malfunctions with the power plug inserted into the power outlet, special caution should be exercised even if the power switch is OFF because it is a single pole switch.

M-3	Main motor unrotated

Possible cause	Step	Check	Result	Remedy
Failure of connector	1	Is the connection of connector P9 on the panel sensor PCB correct?	No	Reconnect the connector.
Main motor (M1)	2	Disconnect connector P9 from the panel sensor PCB. Measure the resistance between the connector pins of the main motor by using a circuit tester. Do the measured resistances satisfy the prescribed values in the table below? P9-5 and P9-6: Approx.4.5 Ω P9-7 and P9-8: Approx.4.5 Ω	No	Replace the main motor.
Main PCB	3	Is the problem solved by replacing the main PCB?	Yes	Replace the main PCB.
Sub motor unrotated	4	Disconnect connector P9 from the panel sensor PCB. Measure the resistance between the connector pins of the main motor by using a circuit tester. Do the measured resistances satisfy the prescribed values in the table below? P9-1 and P9-2: Approx.9.1 Ω P9-3 and P9-4: Approx.9.1 Ω	No	Replace the sub motor.

M-4	No paper supplied

Possible cause	Step	Check	Result	Remedy
Connection failure	1	Is the contact of connector P3 on the panel sensor PCB good?	No	Reconnect the connector.
Panel sensor PCB circuit	2	Set paper in the manual paper slot and make a test print by pressing the switch on the control panel.	No	Replace the panel sensor PCB.
Paper pick-up clutch solenoid		Does the voltage between pins 2 (SOLENOID) and 1 (24V) of the P3 connector on the panel sensor PCB change from approx. 24V DC to 0V within the specified time?	Yes	Replace the paper pick-up solenoid.
MP tray unit failure	3	Is the surface of the separation pad or the pick up roller stained or worn out?	Yes	Clean the surface or replace.
Main PCB	4	Is the problem solved by replacing the main PCB?	Yes	Replace the main PCB.

M-5	Insufficient output from high-voltage power supply unit

Possible cause	Step	Check	Result	Remedy
High-voltage contact	1	Do any of the terminals on the high-voltage contacts have dirt or contact burns?	Yes	Clean the high-voltage contact.
High-voltage power supply PCB	2	Check the connections of the harness between the high-voltage power supply and the panel sensor PCB are secured correctly.	Yes	Replace the high-voltage power supply PCB.
			No	Reconnect the harness between the high-voltage power supply and the panel sensor PCB.

M-6	Fixing heater temperature failure

Possible cause	Step	Check	Result	Remedy
Poor thermistor harness contact	1	Are the connectors on the erase lamp PCB and the high-voltage power supply PCB secured correctly?	No	Connect the connectors securely.
Blown thermal fuse	2	Remove the fixing unit and measure the resistance between the input connectors. Is it open circuit?	Yes	Replace the fixing unit.
Thermistor failure	3	Is the thermistor installed properly?	Yes	Replace the fixing unit.
			No	Reinstall the thermistor properly.
Halogen heater lamp failure	4	Remove the fixing unit and measure the resistance of the fixing unit lamp. Is it open circuit?	Yes	Replace the halogen heater lamp.

M-7	BD failure

Possible cause	Step	Check	Result	Remedy
Harness connection failure	1	Is connector P2 on the panel sensor PCB secured correctly?	No	Connect it securely.

M-8	Scanner failure

Possible cause	Step	Check	Result	Remedy
Harness connection failure	1	Is the connection of the scanner motor connector P5 on the panel sensor PCB secured?	No	Reconnect the connectors securely.
Power supply input	2	Is the voltage between pins 1 (+24VDC) and 2 (GND) of connector P5 on the panel sensor PCB 24VDC?	No	Check if +24VDC is supplied between pins 1 (+24VDC) and 4 (+24VRET) of connector P8 on the panel sensor PCB. If not, check the power supply output on the low-voltage power supply PCB.
			Yes	Replace the scanner unit.

F-1	Double feeding

Possible cause	Step	Check	Result	Remedy
Paper	1	Is paper of a recommended type being used?	No	Instruct the user to use recommended types of paper.
Separation pad	2	Is the surface of the separation pad worn out?	Yes	Replace the MP sheet feeder.

F-2	Wrinkles

Possible cause	Step	Check	Result	Remedy
Paper	1	Is paper of a recommended type being used?	No	Instruct the user to use the recommended types of paper.
	2	Is the wrinkle problem solved if new paper is used?	Yes	Instruct the user how to store paper so that it does not absorb moisture.
Fixing unit entrance guide	3	Is the entrance guide dirty?	Yes	Clean the entrance guide.
Fixing unit	4	Is the pressure roller dirty?	Yes	Clean the pressure roller
			No	Replace the fixing unit.

6. INSPECTION MODE

6.1 Incorporated Inspection Modes

The printer incorporates various inspection modes such as the factory inspection mode and the test print mode. The inspection mode varies depending on the model of the printer.

This printer supports a factory inspection mode, continuous grid pattern print mode, 3 patterns print mode and NV-RAM value dump mode.

The operation of the inspection mode is as follows.

(1) Turn off the power switch of the printer.

(2) With the top cover open, turn on the power switch while holding down the switch on the control panel.

When you enter this inspection mode, the Drum lamp is ON. Holding down the panel switch will cause the lamps to turn ON in the order Drum → Alarm → Ready → Data → Drum. When you release the switch, a mode is selected.

The mode selected is indicated by the lamp which is ON when you release the switch.

The inspection modes are assigned to the respective lamps as shown below.

Lamp	Type of inspection
Drum	Factory inspection mode
Alarm	Continuous grid pattern print mode
Ready	3 patterns print mode (grid, zip, black)
Data	NV-RAM value dump mode
Drum + Alarm *	ROM code reprogramming mode (only when flash memory is fitted)
Alarm + Ready *	RAM check
Ready + Data *	4% density pattern print mode

* Note: For the HL-1050 printer only.

Details of the factory inspection mode are as follows.

This mode is used to check if the sensors in the printer are functioning correctly. In the process of this inspection, the lamps and the switch on the control panel are also checked. On entering this mode, the lamps show the status of the respective sensors as follows;

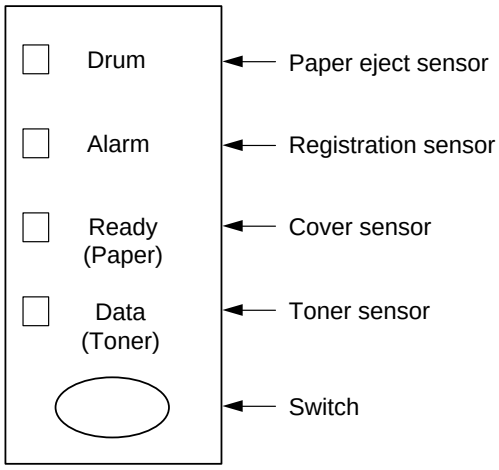


Fig. 4.8

Paper eject sensor	ON (Paper is detected.)	Drum lamp ON
	OFF (No paper is detected.)	Drum lamp OFF
Registration sensor	ON (Paper is detected.)	Alarm lamp ON
	OFF (No paper is detected.)	Alarm lamp OFF
Cover sensor	ON (The top cover is closed.)	Ready lamp OFF
	OFF (The top cover is open.)	Ready lamp ON
Toner sensor	ON (The toner cartridge is installed.)	Data lamp OFF
	OFF (No toner cartridge is installed.)	Data lamp ON

The procedure for the factory inspection mode is as follows.

(1) Turn the printer power switch OFF, open the top cover, and remove the drum unit.

(2) Turn the printer power switch ON while holding down the control panel switch. The Drum lamp comes ON.

(3) Lightly press the panel switch again.

(4) Check that the Drum (paper eject sensor) and Alarm (registration sensor) lamps go OFF after all the lamps have been ON.

If the paper eject sensor is ON at this point, the Drum lamp stays ON (error).

If the registration sensor is ON at this point, the Alarm lamp stays ON (error).

(5) Install the drum unit.

Check that the Data lamp goes OFF.

(6) Lightly touch the registration sensor actuator.

Check that the Alarm lamp comes ON.

(7) Close the top cover.

Check that the Ready lamp goes OFF.

(8) Press the control panel switch.

(9) If all the sensors are correct, the printer goes back to the Ready status. If any error is detected, the corresponding lamp stays ON.

6.2 Error Codes

In the event of a printer failure, error codes will be indicated as shown below. All the lamps and the specific lamps are turned ON alternately. The specific combination of lamps that are ON indicates the type of the error.

Type of error	Data	Ready	Alarm	Drum
Fuser Malfunction				O
Laser BD Malfunction			O	
Scanner Malfunction			O	O
ROM Error		O		
D-RAM Error		O		O
Service A *		O	O	
Service B *		O	O	O
Service C	O			
Service D	O			O
Service E0	O		O	
Service E1	O		O	O
Service P	O	O		
NV-RAM Error	O	O		O
CPU Runtime Error *	O	O	O	O

* Refer to the further description of these errors as follows;

- Service A: Address Error
- Service B: Bus Error
- CPU Runtime Error: A CPU error other than the above two defects, such as an Illegal Instruction or Operation Overflow

HOW THE LAMPS INDICATE AN ERROR

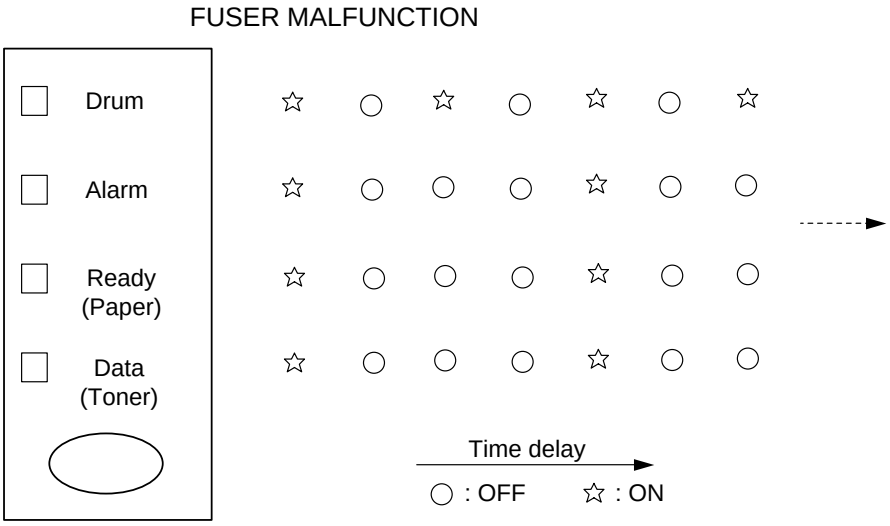


Fig. 4-9

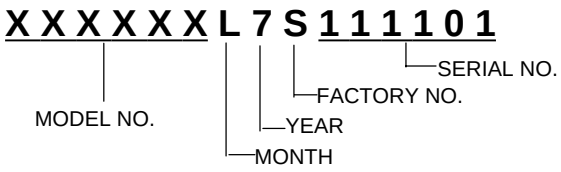
APPENDIX 1. SERIAL NO. DESCRIPTIONS

The descriptions below show how to read labels on each printer and part.

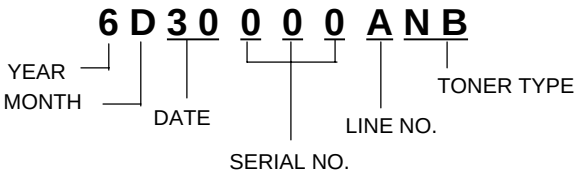
< ID for production month >

A:	January	E:	May	J:	September
B:	February	F:	June	K:	October
C:	March	G:	July	L:	November
D:	April	H:	August	M:	December

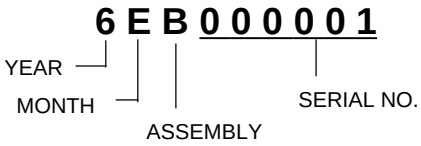
(1) Printer .....on the main body



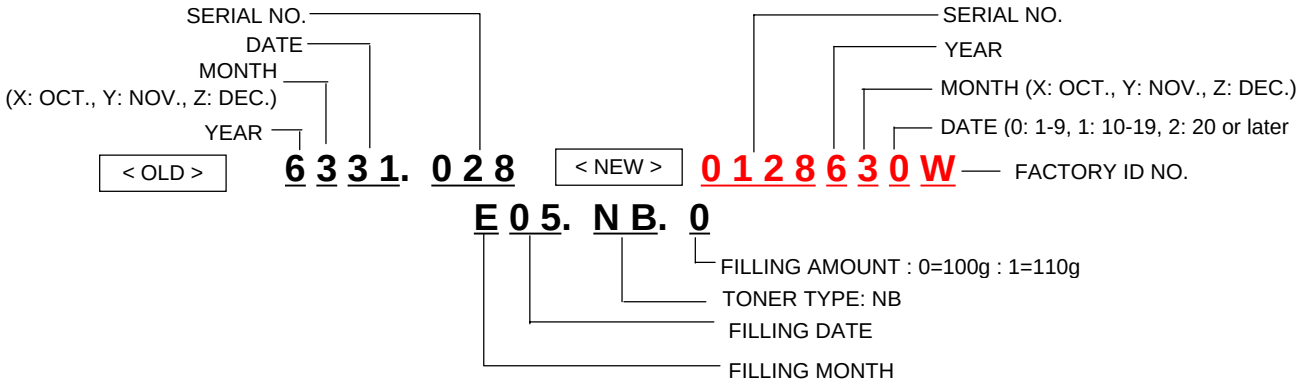
(2) Process unit .....on the package of the process unit
(Drum unit with toner cartridge)



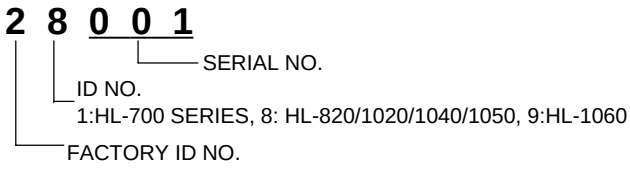
(3) Drum unit .....on the drum unit



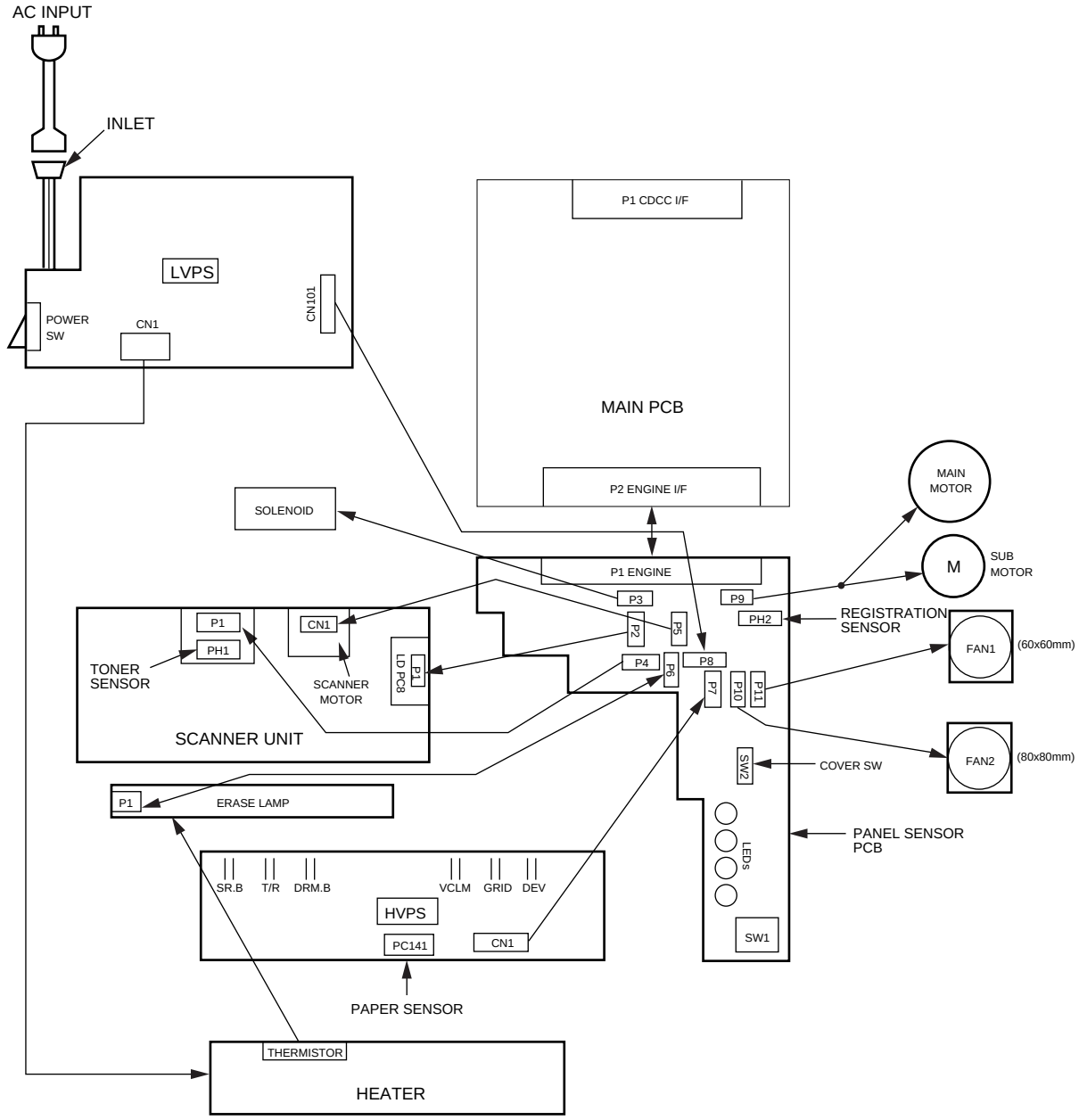
(4) Toner cartridge .....on the toner cartridge



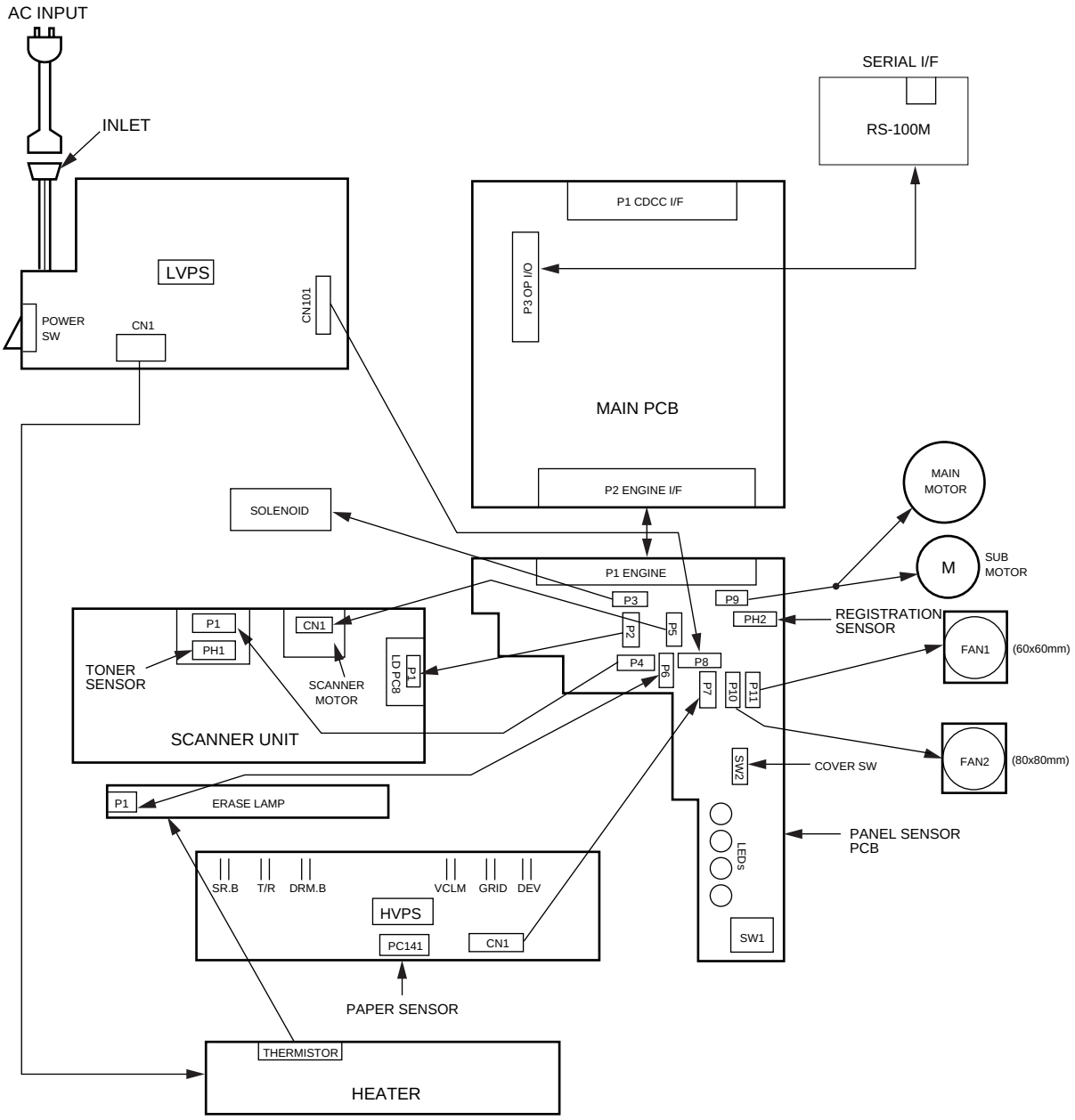
(5) Scanner unit .....on the scanner unit



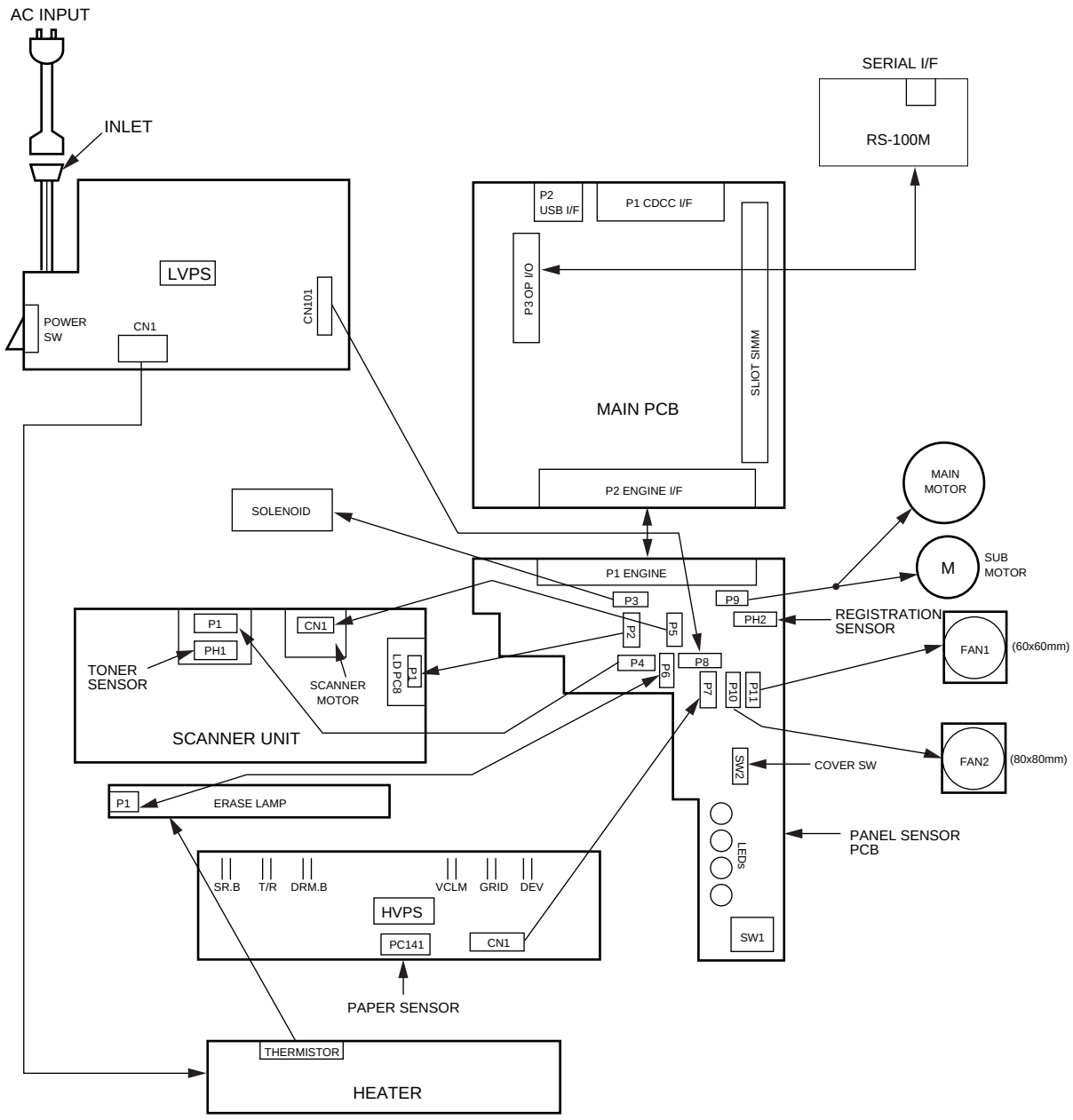
Appendix 2. Connection Diagram, HL-820/1020

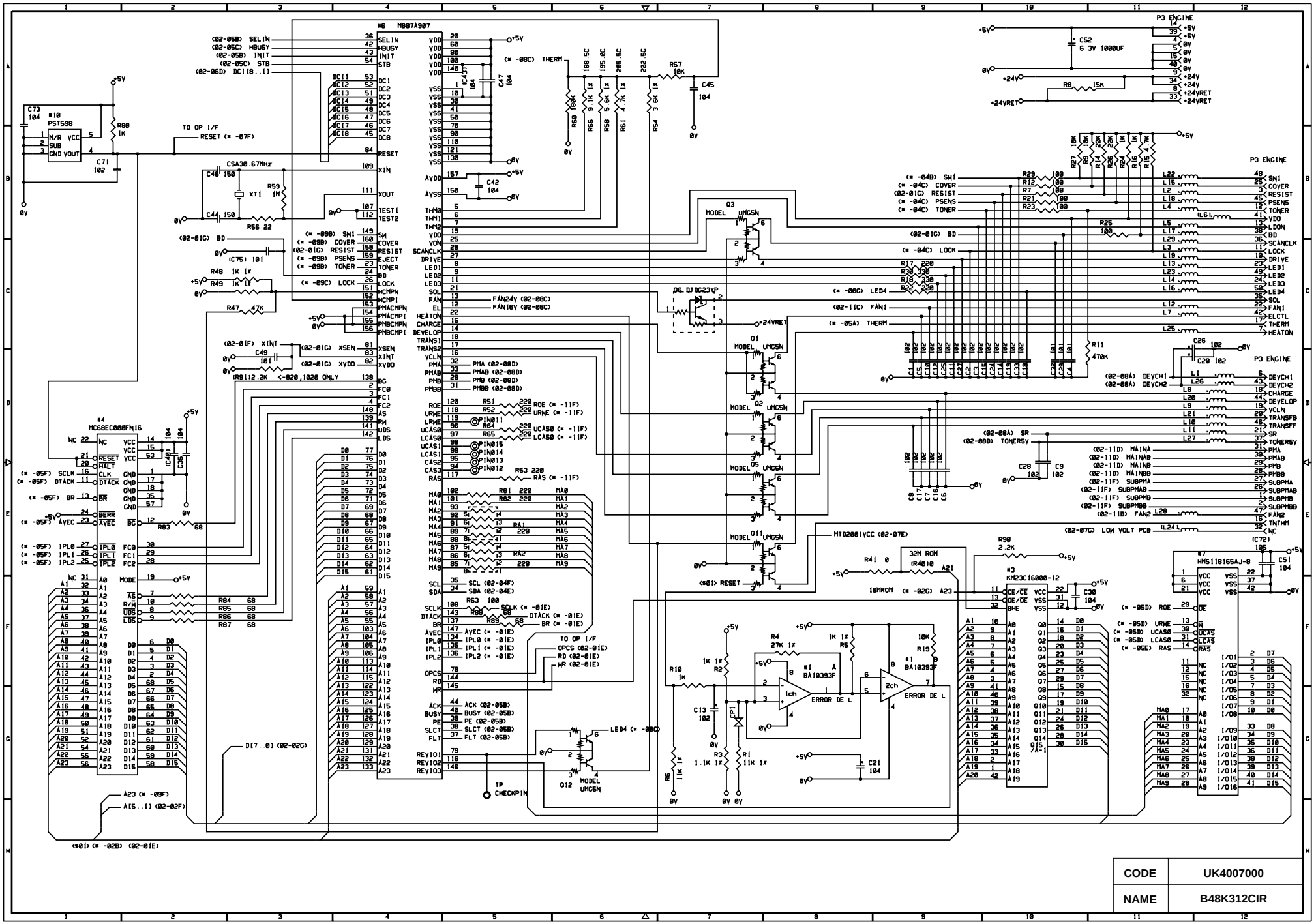


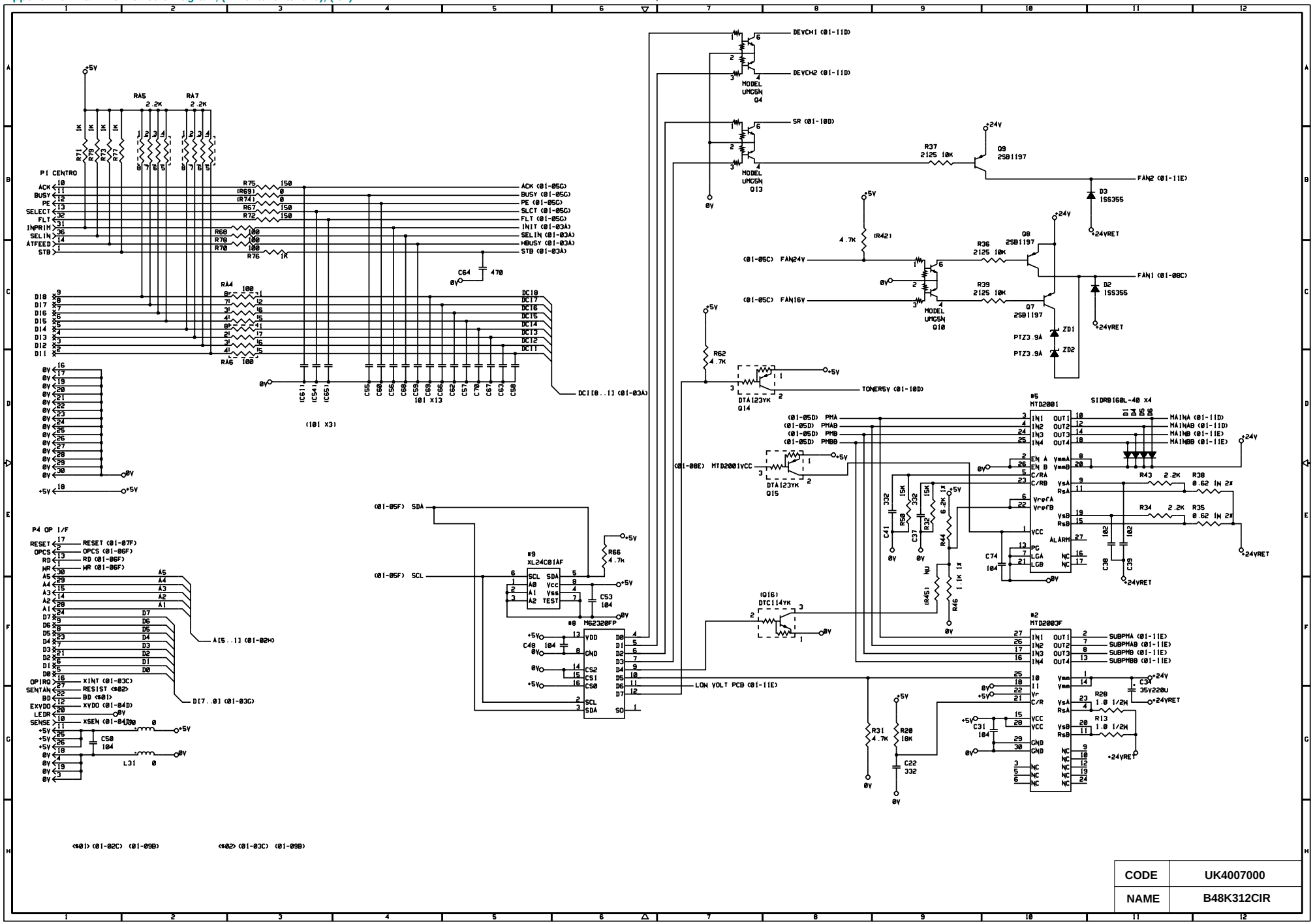
Appendix 3. Connection Diagram, HL-1040

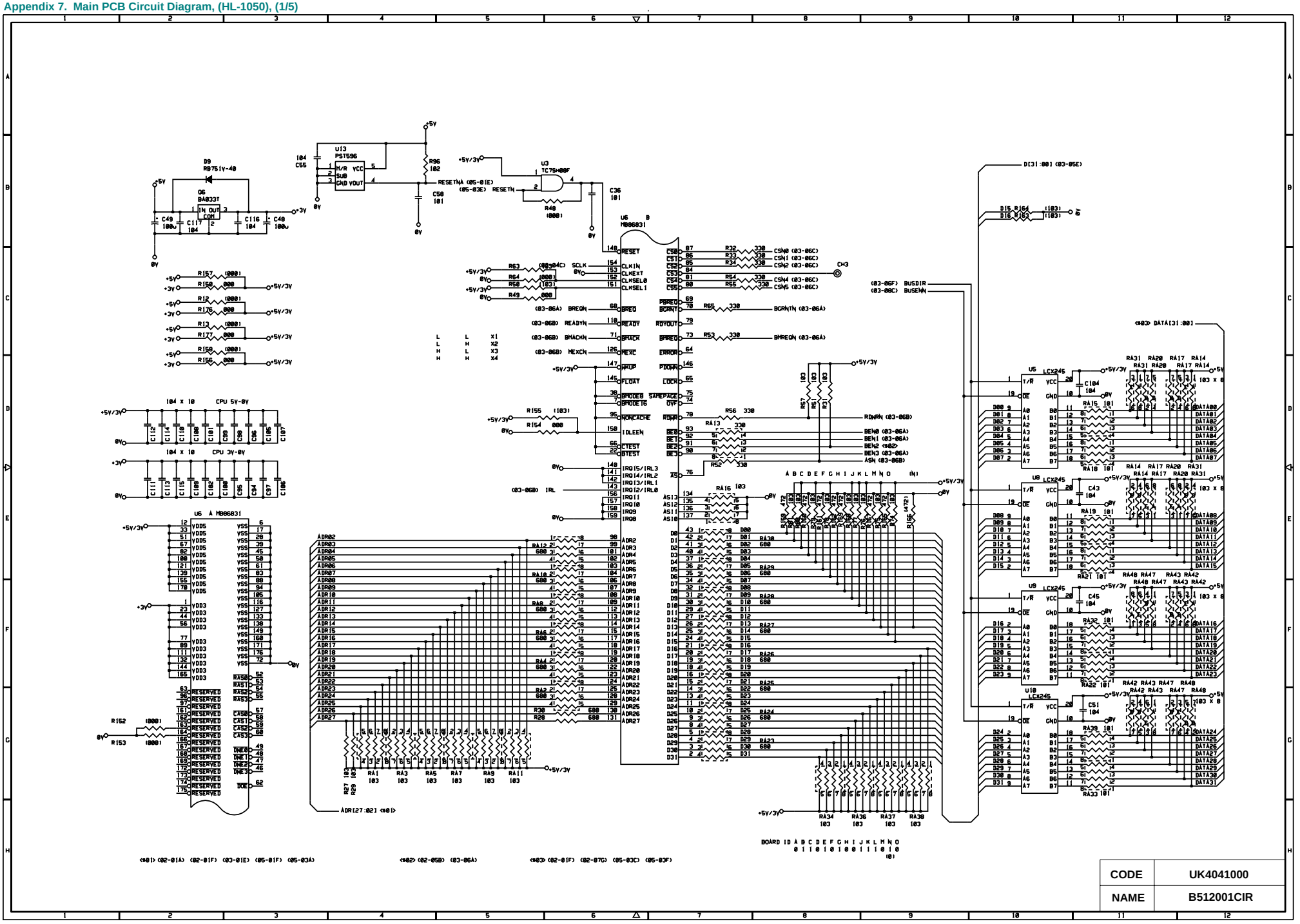


Appendix 4. Connection Diagram, HL-1050

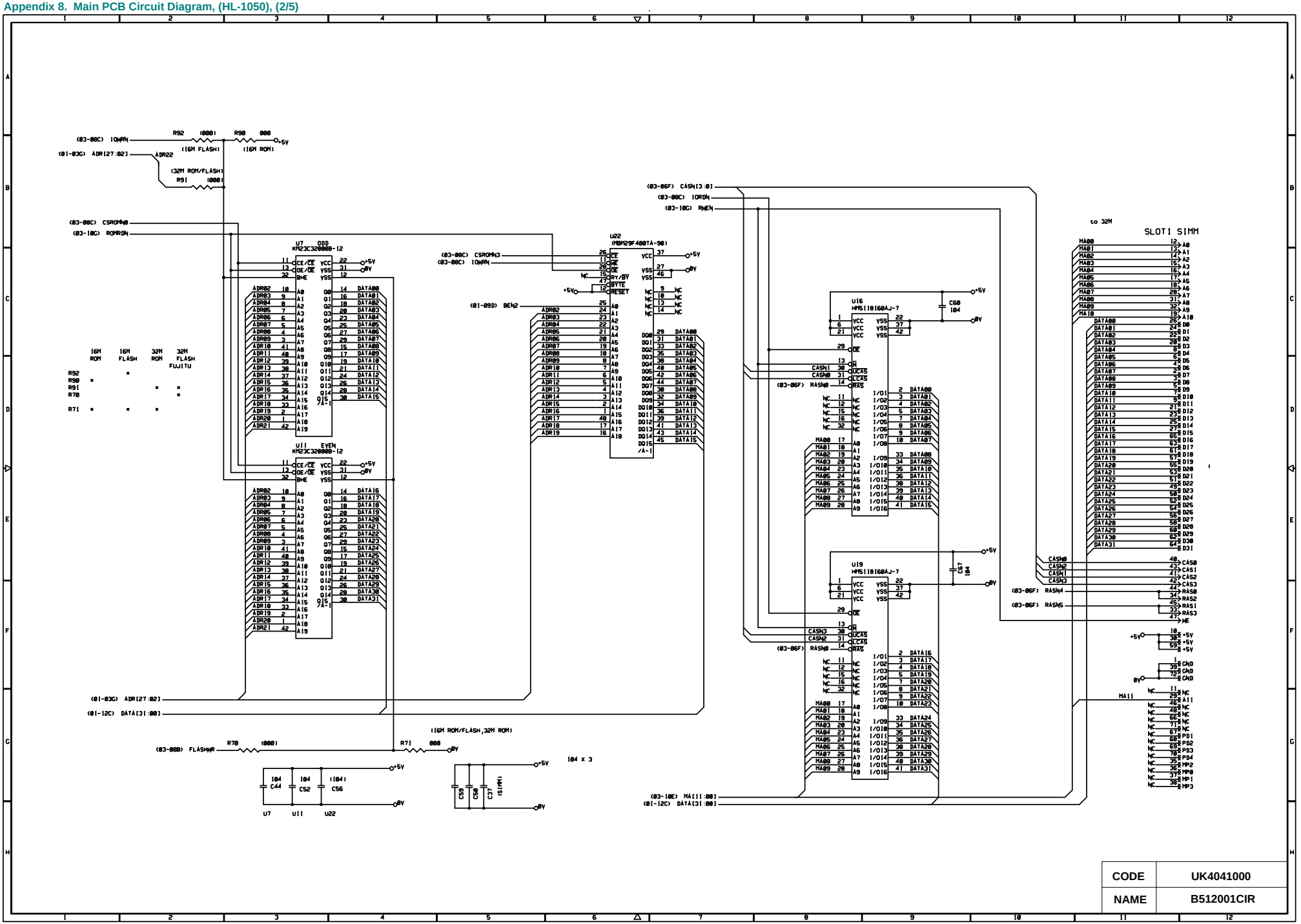


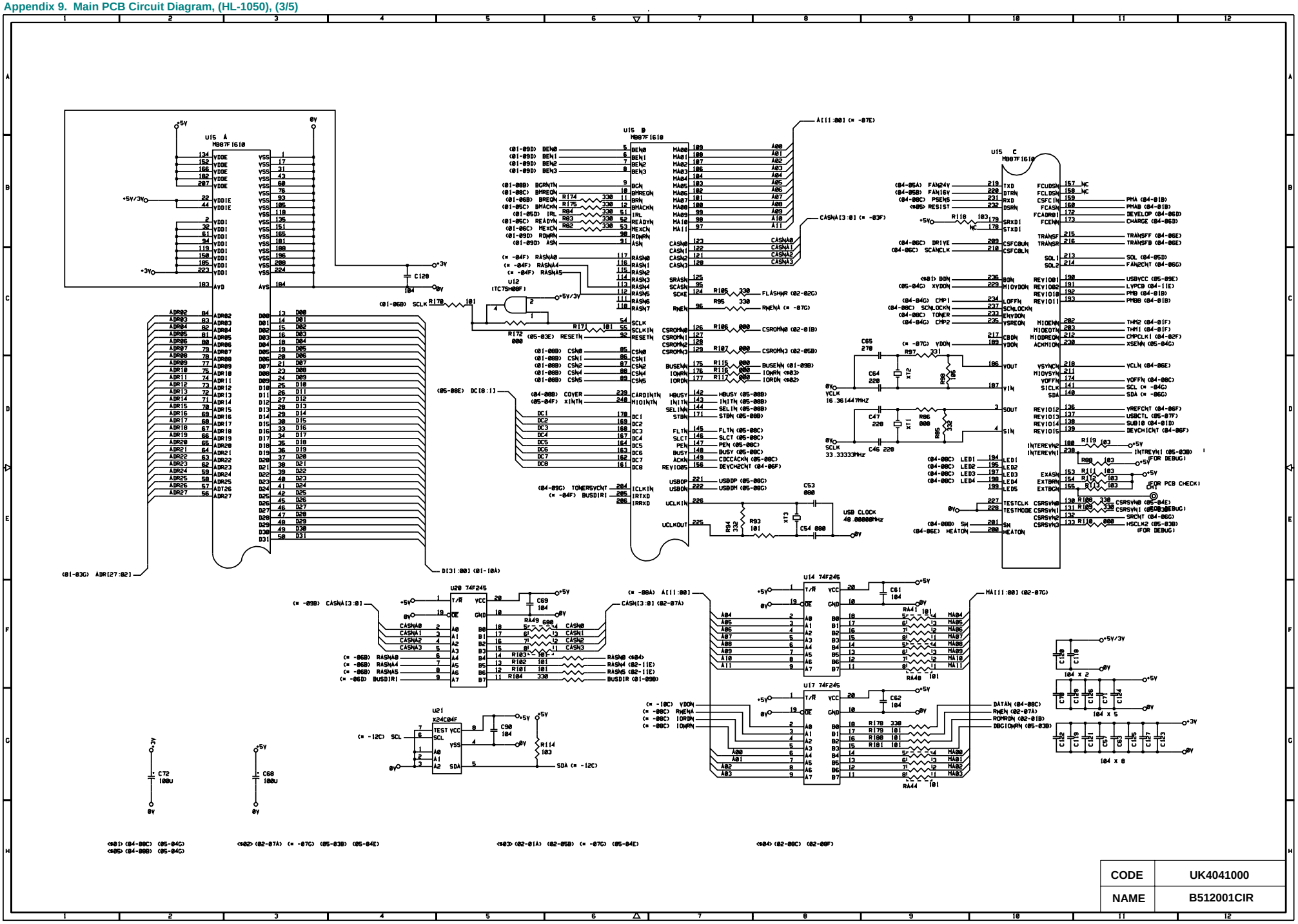

CODE
UK4007000
NAME
B48K312CIR


P1 CENTRO
P4 OP I/F
DEVCH1 (01-11D)
DEVCH2 (01-11D)
SR (01-10D)
FAN2 (01-11E)
FAN1 (01-08C)
TONER5V (01-10D)
LOW VOLT PCB (01-11E)
DCI[8..1] (01-03A)
A[5..1] (01-02H)
D[7..0] (01-03C)
MAINA (01-11D)
MAINAB (01-11D)
MAINB (01-11E)
MAINBB (01-11E)
SUBPMA (01-11E)
SUBPMAB (01-11E)
SUBPMB (01-11E)
SUBPMBB (01-11E)
CODE
UK4007000
NAME
B48K312CIR

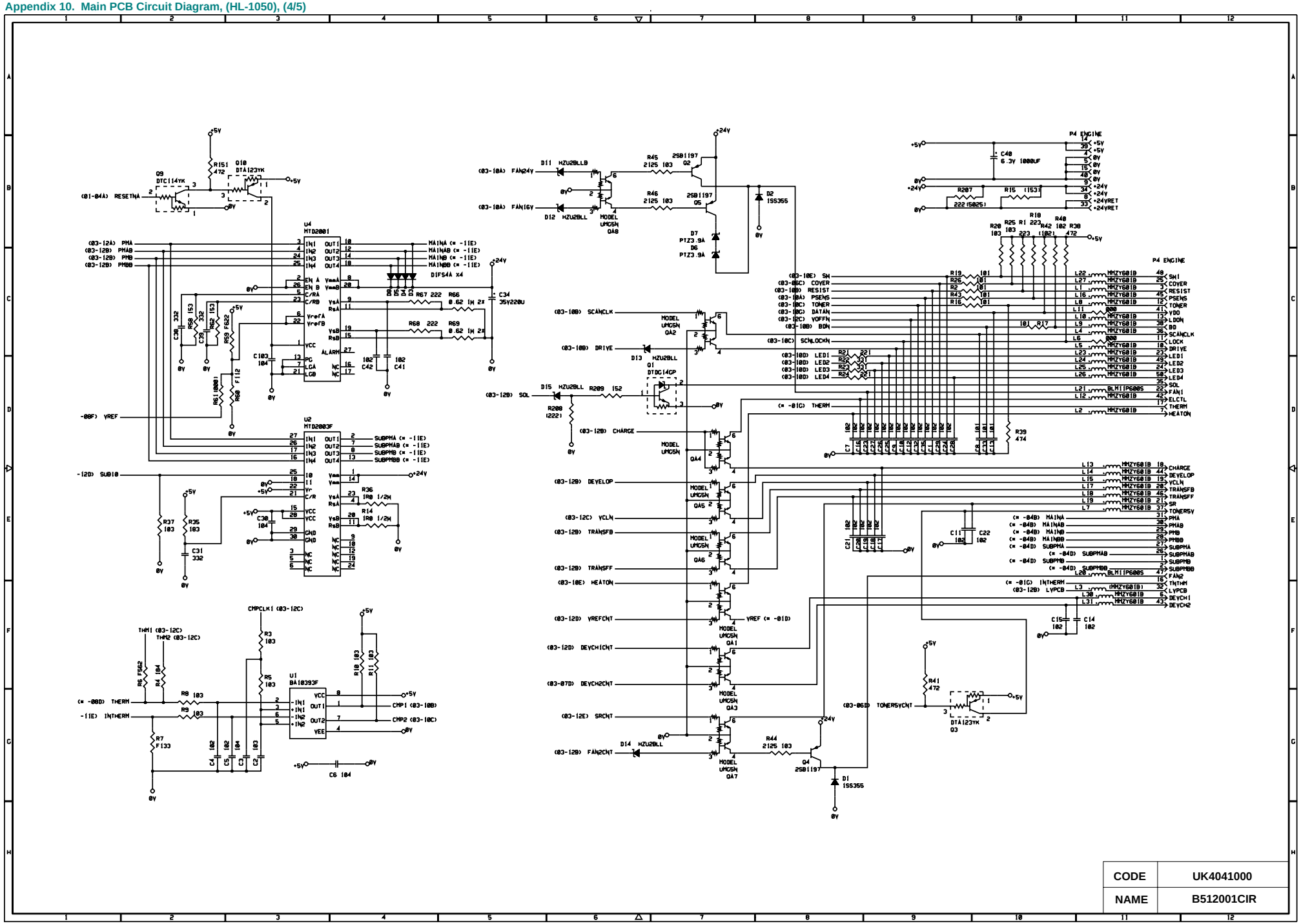


CODE	UK4041000
NAME	B512001CIR

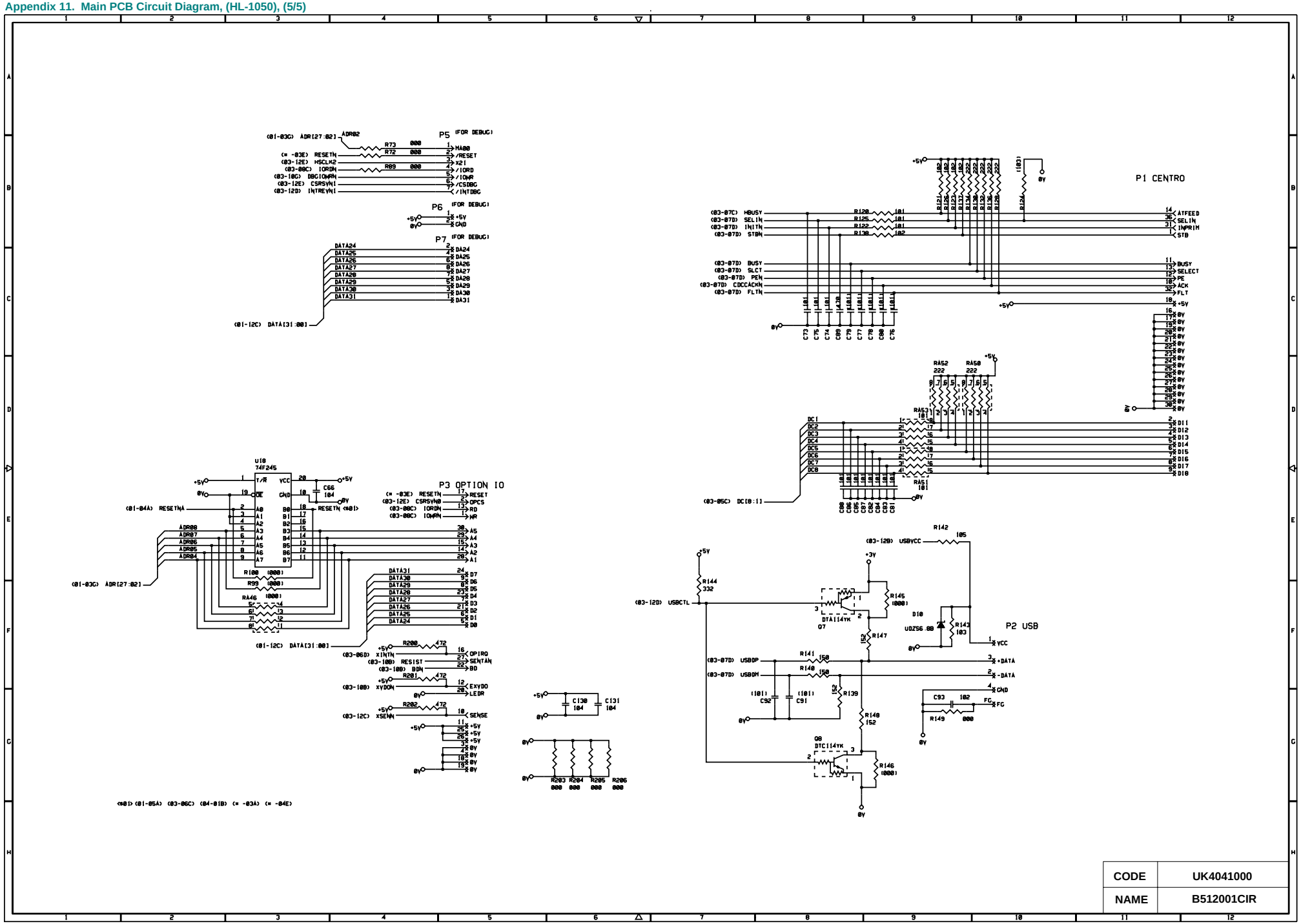

(03-08C) IOWRN
(01-03C) ADR[27:02]
R92 (000) R90 000
(16M FLASH)
(16M ROM)
ADR22
(32M ROM/FLASH)
R91 (000)
(03-08C) CSROMN0
(03-10C) ROMRDN
16M ROM
16M FLASH
32M ROM
32M FLASH FUJITU
R92
R90
R91
R70
R71
U7 ODD
KM23C32000B-12
U11 EVEN
KM23C32000B-12
U22
MBM29F400TA-90
(03-08C) CSROMN3
(03-08C) IOWRN
(03-09D) BEN2
(01-03C) ADR[27:02]
(01-12C) DATA[31:00]
(03-08B) FLASHWR
R70 (000)
R71 000
(16M ROM/FLASH,32M ROM)
104 x 3
C44 104
C52 104
C56 (104)
C58
C59
C37 (SIMM)
U7
U11
U22
(03-06F) CASN[3:0]
(03-08C) IORDN
(03-10C) RMEN
U16
HMS118160AJ-7
U19
HMS118160AJ-7
C68 104
C67 104
(03-06F) RASN0
(03-06F) RASN4
(03-06F) RASN5
CASN0
CASN1
CASN2
CASN3
to 32M
SLOT1 SIMM
(03-10E) MA[11:00]
(01-12C) DATA[31:00]
CODE
UK4041000
NAME
B512001CIR

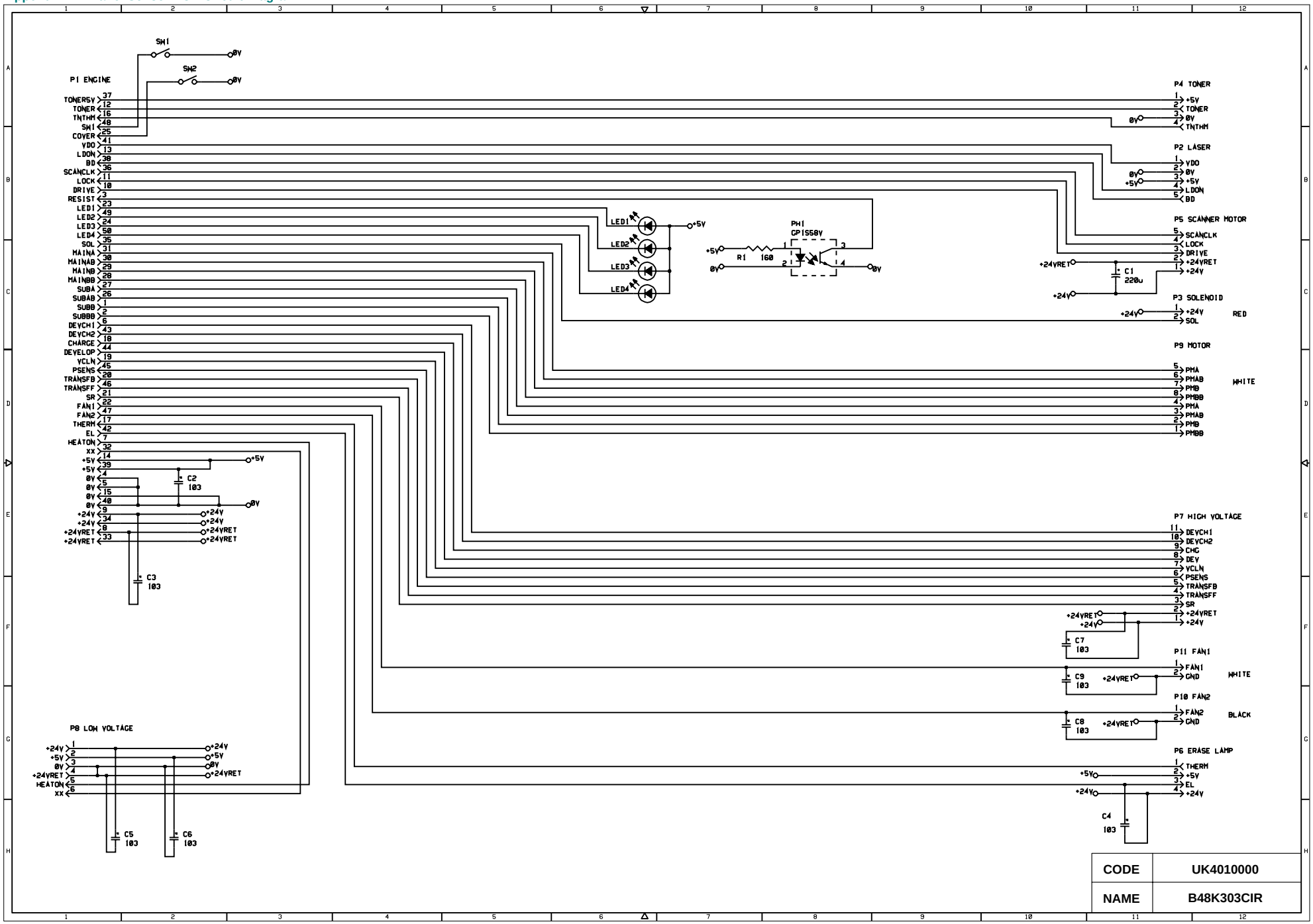


CODE	UK4041000
NAME	B512001CIR

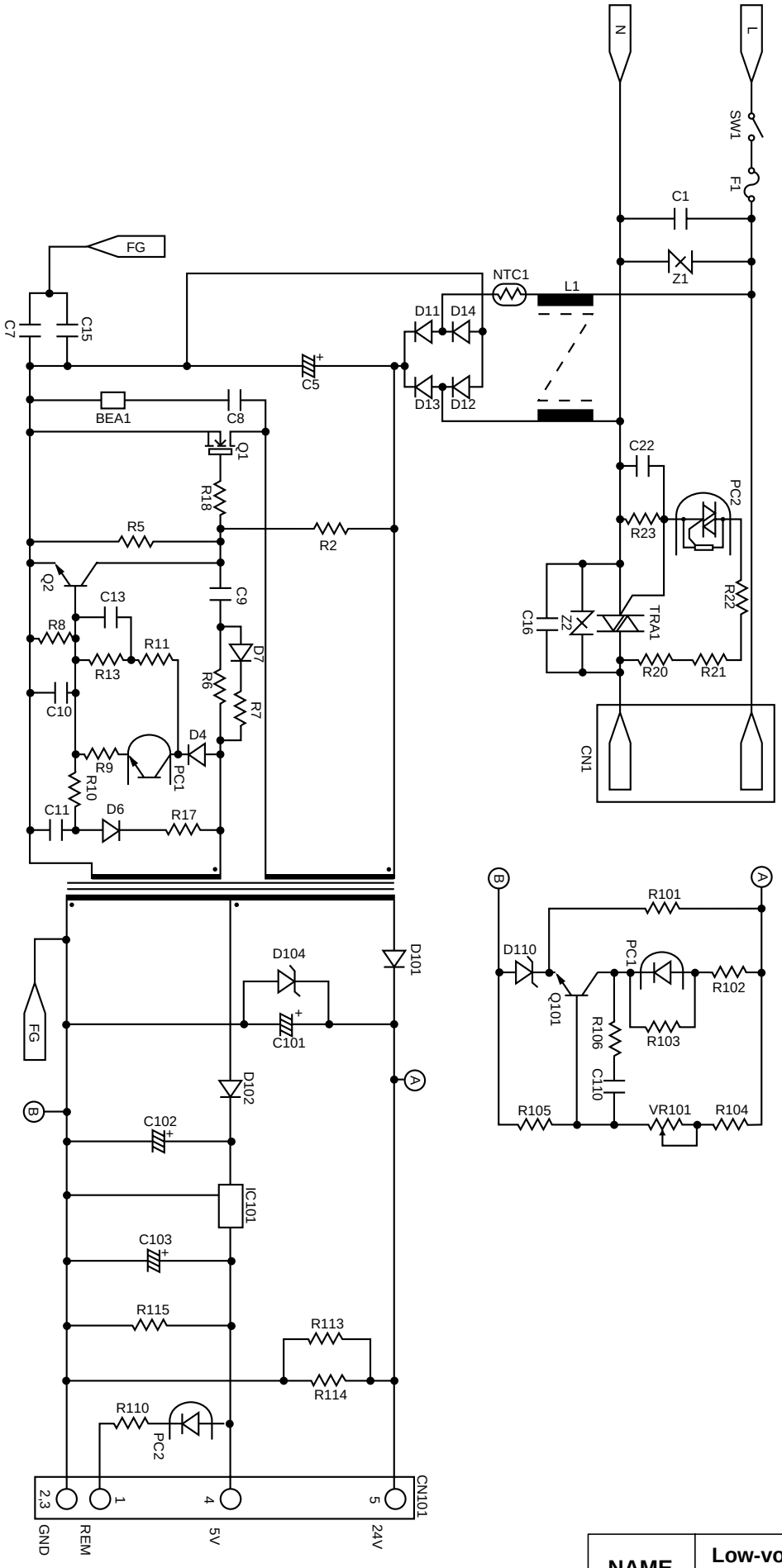


CODE	UK4041000
NAME	B512001CIR


P5 (FOR DEBUG)
P6 (FOR DEBUG)
P7 (FOR DEBUG)
P1 CENTRO
P3 OPTION IO
P2 USB
U10
74F245
Q7
Q8
D10
CODE
UK4041000
NAME
B512001CIR

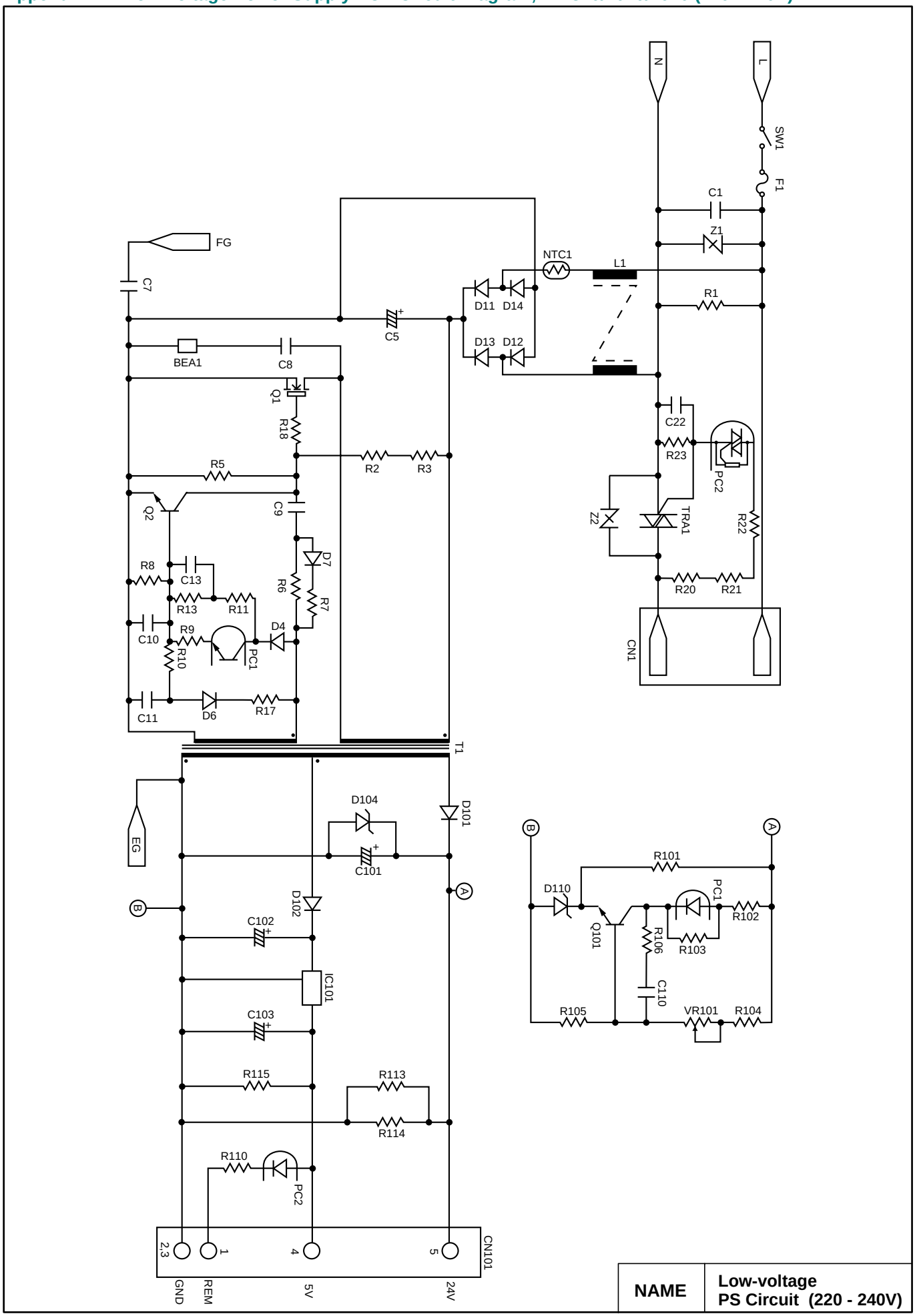

SW1
SW2
0V
P1 ENGINE
TONER5V 37
TONER 12
TNTHM 16
SW1 48
COVER 25
VDO 41
LDON 13
BD 38
SCANCLK 36
LOCK 11
DRIVE 10
RESIST 3
LED1 23
LED2 49
LED3 24
LED4 50
SOL 25
MAINA 31
MAINAB 30
MAINB 29
MAINBB 28
SUBA 27
SUBAB 26
SUBB 1
SUBBB 2
DEVCH1 6
DEVCH2 43
CHARGE 10
DEVELOP 44
VCLN 19
PSENS 45
TRANSFB 20
TRANSFF 46
SR 21
FAN1 22
FAN2 47
THERM 17
EL 42
HEATON 7
XX 32
+5V 14
+5V 39
0V 4
0V 5
0V 15
0V 40
+24V 9
+24V 34
+24VRET 8
+24VRET 33
C2 103
C3 103
LED1
LED2
LED3
LED4
+5V
PH1 GP1S58V
R1 160
P4 TONER
P2 LASER
P5 SCANNER MOTOR
P3 SOLENOID
RED
P9 MOTOR
WHITE
C1 220u
P7 HIGH VOLTAGE
DEVCH1
DEVCH2
CHG
DEV
VCLN
PSENS
TRANSFB
TRANSFF
SR
C7 103
P11 FAN1
C9 103
WHITE
P10 FAN2
C8 103
BLACK
P8 LOW VOLTAGE
C5 103
C6 103
P6 ERASE LAMP
C4 103
CODE UK4010000
NAME B48K303CIR

Appendix 13. Low-voltage Power Supply PCB Circuit Diagram, HL-820/1020/1040 (110 - 120V)

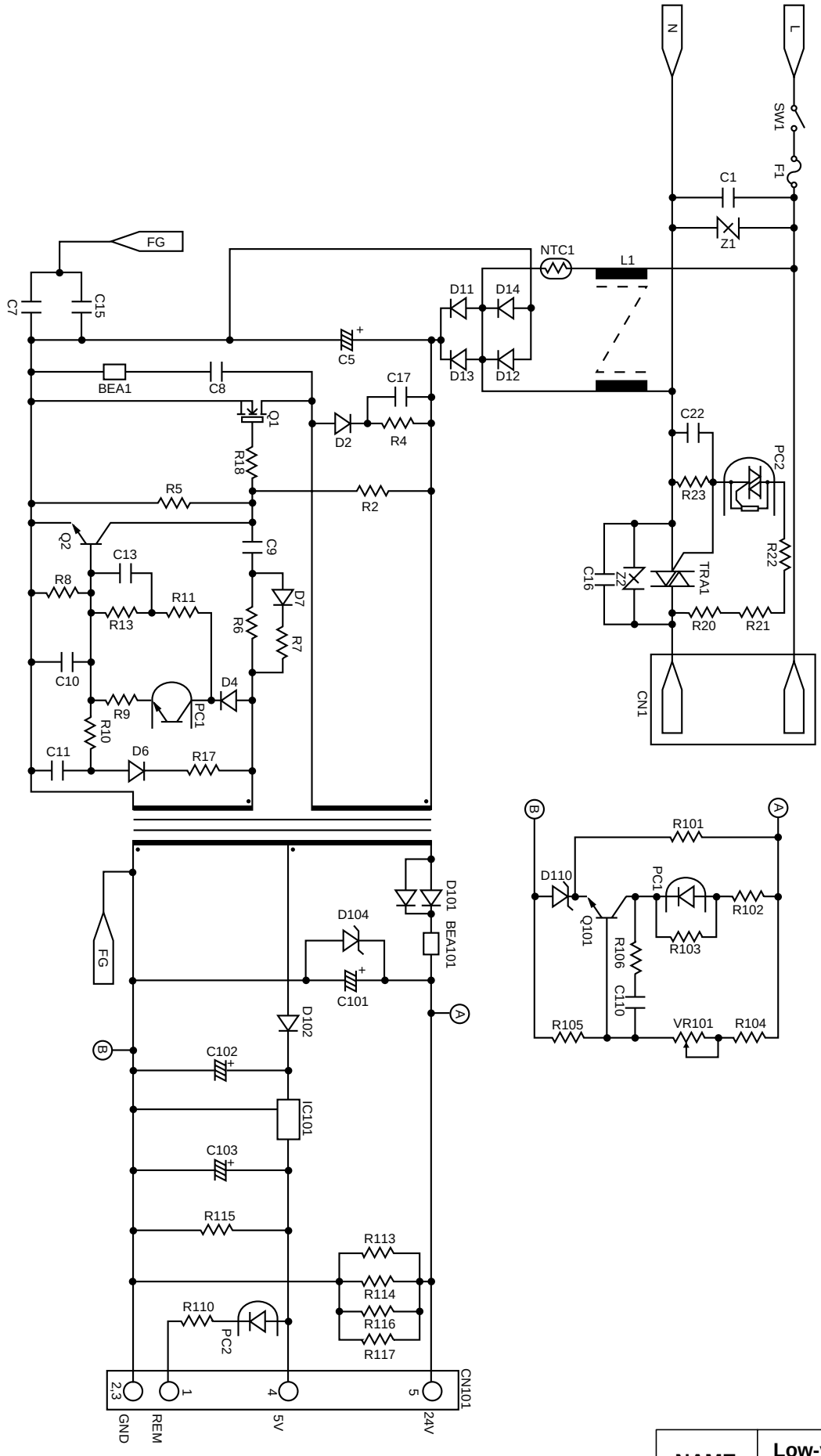


NAME	Low-voltage PS Circuit (110 - 120V)

Appendix 14. Low-voltage Power Supply PCB Circuit Diagram, HL-820/1020/1040 (220 - 240V)

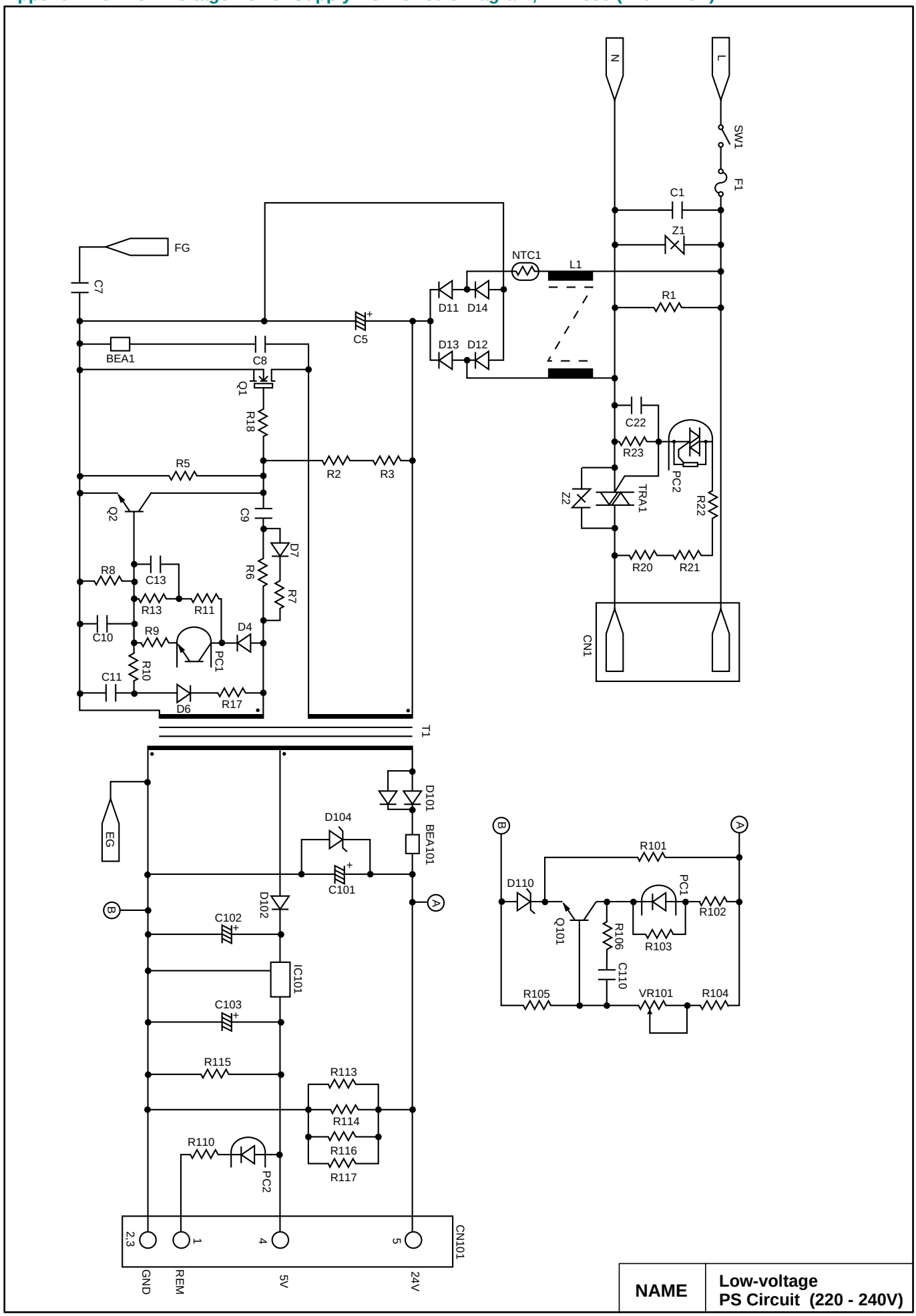


Appendix 15. Low-voltage Power Supply PCB Circuit Diagram, HL-1050 (110 - 120V)

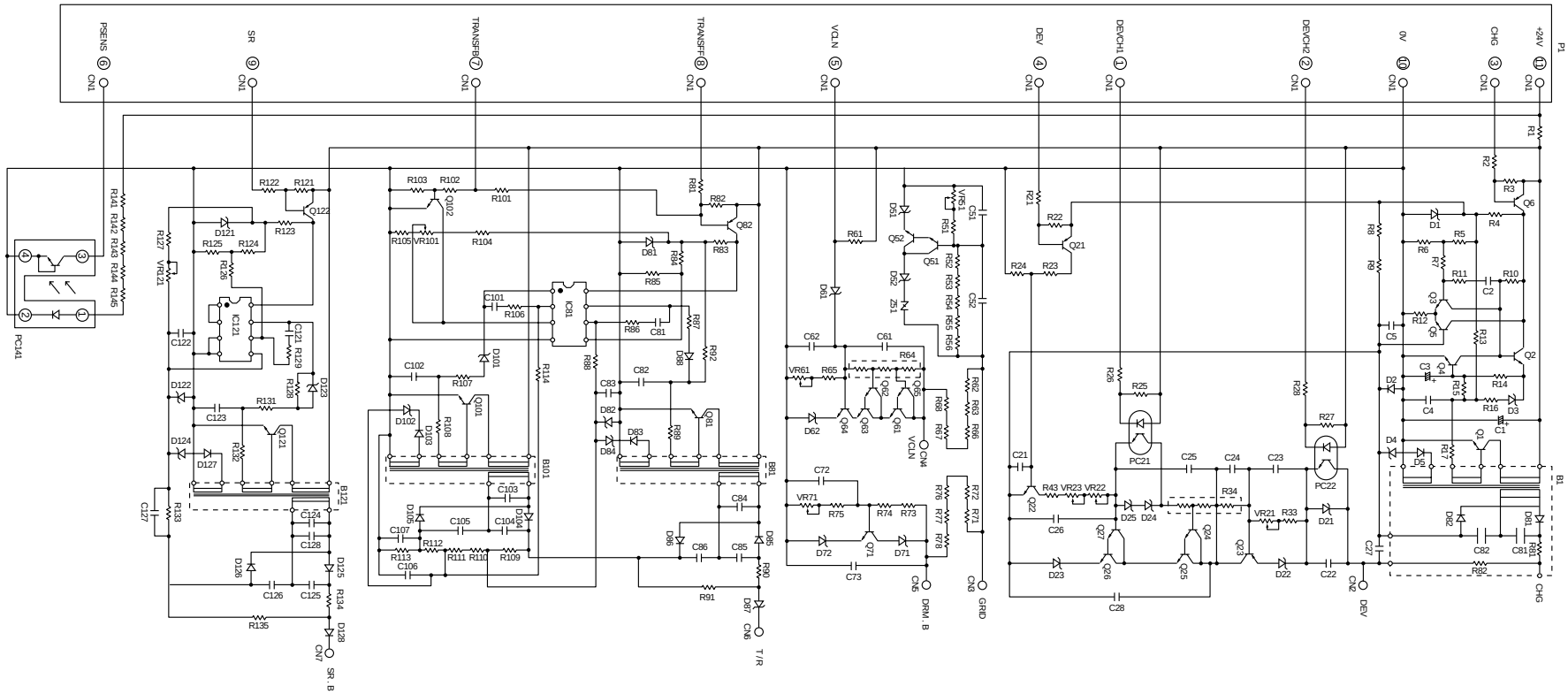


NAME	Low-voltage PS Circuit (110 - 120V)

Appendix 16. Low-voltage Power Supply PCB Circuit Diagram, HL-1050 (220 - 240V)



NAME	Low-voltage PS Circuit (220 - 240V)



NAME	High-voltage PS Circuit

APPENDIX 18. HOW TO KNOW DRUM UNIT LIFE & PAGE COUNTER

If you want to know the drum unit life or the number of printed pages, you should print out the test print page (for HL-820/1020) or the print configuration page(s) (HL-1040/1050).

Print Test Print or Print Configuration

1) Turn on the power switch of the printer while pressing the control panel switch.
2) Release the panel switch when the Drum lamp comes on.
3) Press the panel switch and release it when the Alarm lamp comes on.
4) Print the page(s) of Test Print or Print Configuration.

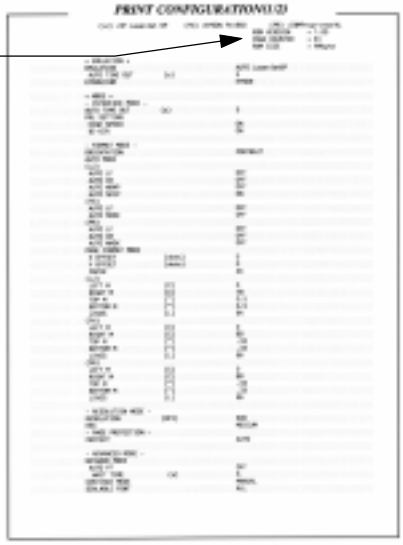
Note:

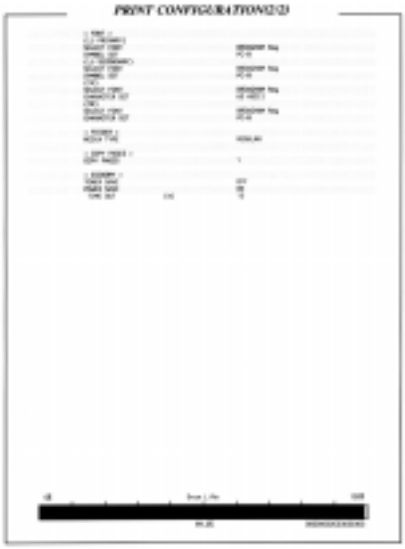
- *The design of Test Print and Print Configuration vary depending on the printer model. Refer to the figures below;*
- ***The ** marks in the figures show the page counter. They are not printed in some countries.***

<HL-820/1020>

<HL-1040>

<HL-1050>

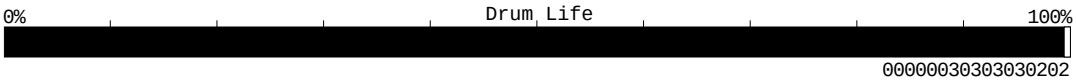




How to Read the Drum Life

The bar shown below is printed at the bottom of Test Print / Print Configuration.

- It initially indicates 100% and gradually decreases.
- It indicates 0% when the Drum lamp is on.
- It stays at 0% even if further printing is done.



How to Read the Page Counter

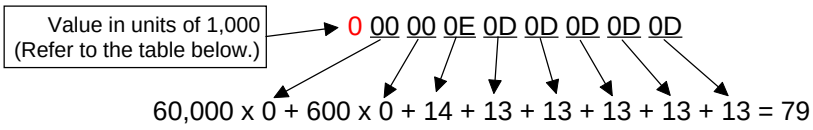
The page counter is not shown directly for some countries. (Refer to the note in the previous page.)

However, the values printed at the right below of the drum life bar, which are available in all countries, indicate the number of the printed pages in a unit of 1 and in a unit of 1,000.

- Value in a unit of 1

The hexadecimal value stored in NV-RAM is printed.

Example: 000000E0D0D0D0D0D



60,000 x 0 + 600 x 0 + 14 + 13 + 13 + 13 + 13 + 13 = 79

- Value in units of 1,000

Page counter indicated by units of 1,000 pages.

0 - 99 pages	0	600 - 699 pages	6
100 - 199 pages	1	700 - 799 pages	7
200 - 299 pages	2	800 - 899 pages	8
300 - 399 pages	3	900 - 999 pages	9
400 - 499 pages	4	1,000 - 1,999 pages	A
500 - 599 pages	5	2,000 - 2,999 pages	B

APPENDIX 19. DIAMETER / CIRCUMFERENCE OF ROLLERS

The diameter and circumference of each roller are listed below;

No.	Parts Name	Diameter (Circumference)
1	Paper Feed Roller	ϕ 11.97 mm (37.6 mm)
2	Transfer Roller	ϕ 16.90 mm (53.1 mm)
3	OPC Drum	ϕ 29.97 mm (94.1 mm)
4	Heat Roller	ϕ 19.86 mm (62.4 mm)
5	Pressure Roller	ϕ 16.50 mm (51.8 mm)